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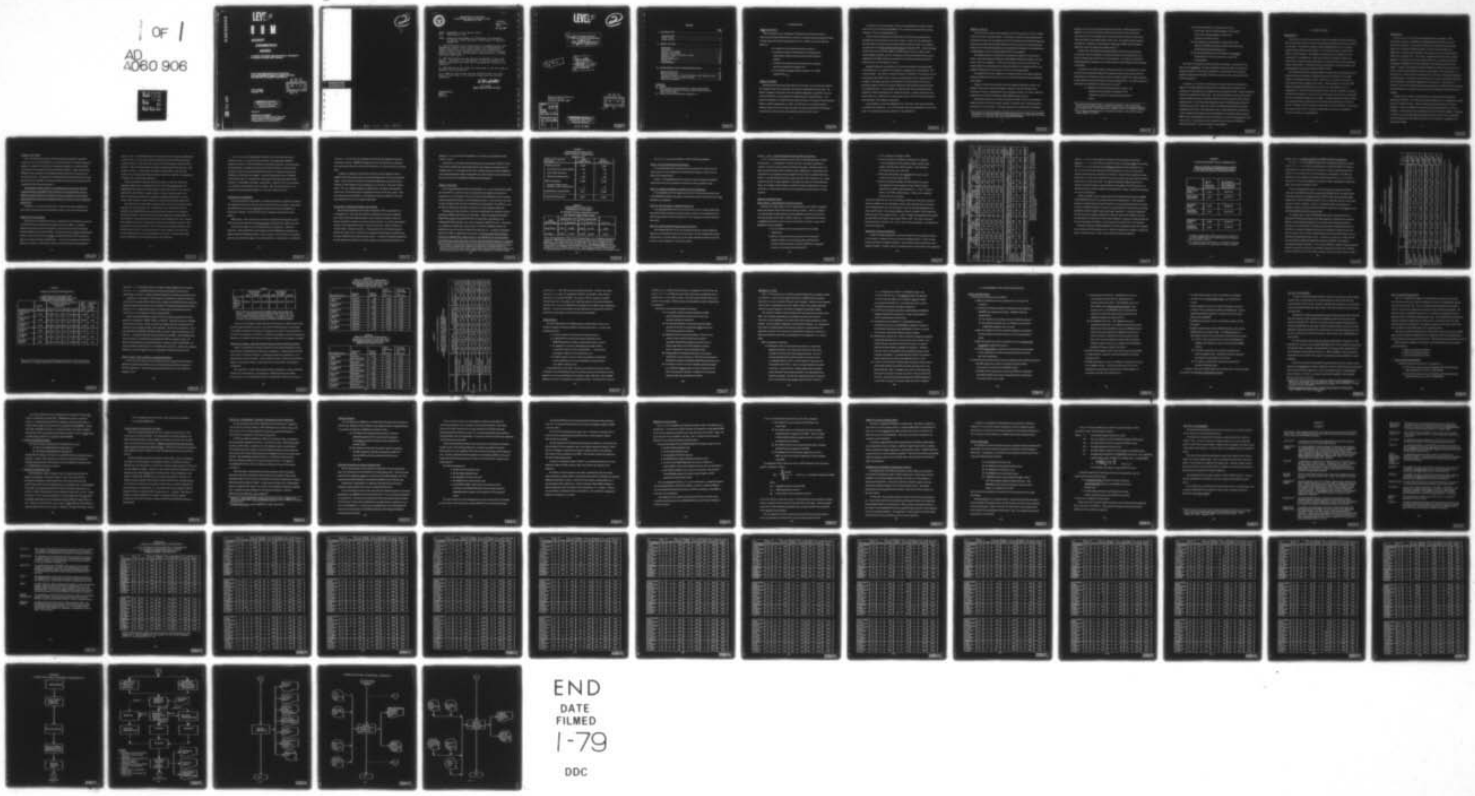

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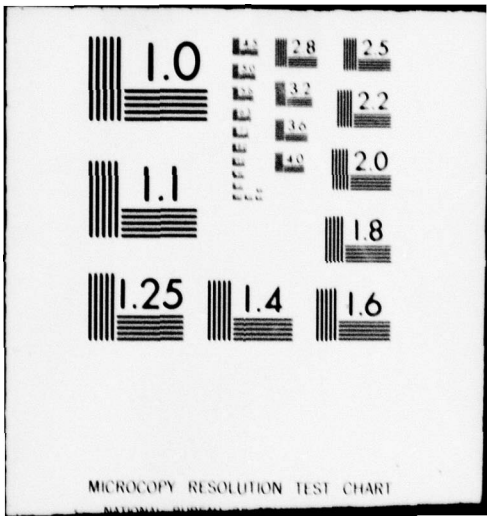
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LEVEL II

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RECRUIT DISTRIBUTION MODEL

A NETWORK FLOW MODEL PROVIDING OPTIMAL ASSIGNMENTS OF RECRUITS TO ENTRY LEVEL TRAINING

STUDY AND DEVELOPMENT OF TECHNIQUES AND PROCEDURES TO ACHIEVE A MORE EQUITABLE DISTRIBUTION OF MINORITY ACCESSIONS

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FINAL REPORT
November 1977

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Prepared for:

MANPOWER MANAGEMENT
INFORMATION SYSTEMS BRANCH (CODE MPI)
DEPUTY CHIEF OF STAFF FOR MANPOWER
HEADQUARTERS, U.S. MARINE CORPS

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DEPARTMENT OF THE NAVY
HEADQUARTERS UNITED STATES MARINE CORPS
WASHINGTON, D.C. 20380

IN REPLY REFER TO
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27 JUL 1978

From: Commandant of the Marine Corps
To: Distribution List

Subj: Study and Development of Techniques and Procedures to Achieve a More Equitable Distribution of Minority Accessions

1. The objectives of the study were to recommend policy and procedural changes which would improve the distribution of racial minorities in the Marine Corps, while maintaining overall Marine Corps effectiveness, and to provide the capability to manage the distribution of minorities on a current and trend-type basis.

2. The objectives were met and are documented in the Final Report. In general, an improvement in the distribution of racial minorities into hard skill occupational fields can be expected.

3. The results of the study are concurred in and the study is approved for distribution.

4. A copy of this letter will be affixed inside the front cover of each copy of the subject study prior to its distribution.

W. H. Fitch

W. H. FITCH
DEPUTY CHIEF OF STAFF FOR RD&S

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LEVEL II

2

6 STUDY AND DEVELOPMENT OF TECHNIQUES AND PROCEDURES TO ACHIEVE A MORE EQUITABLE DISTRIBUTION OF MINORITY ACCESSIONS.

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9 FINAL REPORT.

15 Contract M00027-77-C-0014

11 November 1977

Decision Systems Associates, Inc.
350 Fortune Terrace
Rockville, Maryland 20854

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DECISION SYSTEMS DSA ASSOCIATES, INC.

I. INTRODUCTION

PURPOSE OF REPORT

This Final Report on the "Development of Techniques and Procedures to Aid in Achieving a More Equitable Distribution of Minority Accessions Among Occupational Fields" has been prepared by Decision Systems Associates, Inc. (DSAI), to meet the following objectives:

- To summarize the work performed under the contract;
- To provide an analysis of the gaming runs which specifically address delays awaiting training and the minority imbalance problem;
- To present the consequences (costs) of alternative assignment policies and optimization tradeoffs; and
- To recommend an assignment policy configuration for USMC implementation.

FORMAT OF REPORT

Recognizing the diverse potential audience for this report, the contractor has modified the customary format in the presentation of information developed during the study. The format is designed so that readers with little manpower background, especially in the area of recruit distribution, may be adequately informed solely by reading Section II. That section was prepared in a modified military staff study format at the request of the Contracting Officer's Technical Representative in MPI. The staff study is not concerned with the technical aspects of the newly enhanced model, but concerns itself solely with the impact on alternative solutions resulting from alternative model execution options.

Accepting that the typical reader of Section II most probably has not been involved with the Recruit Distribution Model (RDM) as it has evolved over the last thirteen years, a glossary has been provided (Appendix A).

Section III briefly describes the enhancements which have been programmed into the model during the execution of the current contract. In the event the reader desires more information concerning this quite sophisticated and effective model, he is directed to Volume One of the User's Guide/Technical Report of September 1977. The first 26 pages of that report (on file with MPI, MMEA, and MPH) present the more complex overall recruit assignment problem, provide a comprehensive functional description of the various components of the RDM, offer some evaluation data concerning the effectiveness of the model, and trace its chronological evolution.

Appendix B presents a recapitulation of the minority distributions obtained by RDM in the operational run in addition to all gaming run configurations for the September 1977 recruit graduates. These data are presented for general information. The data show how the overall percentage (31%) of minority recruits was allocated to the 37 occupational fields. In addition, the reader may observe the distribution of minority Marines in the various guarantee programs and thus the constraints imposed by these enlistment guarantee options on the RDM solutions. It is also possible, by comparing the initial recruit pool minority composition (31%) to the RDM minority distribution outcome, to observe the impact of the overall talent mix, enlistment terms, and guarantee status on the final minority distribution given September 1977 assignment prerequisites.

The last appendix in this report (Appendix C) is a flow chart of the normal processing in the RDM and a SIMAAR run. This chart should be referenced periodically as one reads the report, thus keeping the sequential operations in clear perspective.

PROJECT OVERVIEW

In recent years the issue of equal opportunity for minority personnel in the U.S. Marine Corps has received increasing attention. The increase in minority accessions experienced by the Marine Corps since the inauguration of the All Volunteer Force and the accompanying difficulties associated with equitable distribution of those accessions into the full spectrum of Entry-Level Training (ELT) opportunities necessitated the development and implementation of methodologies to ensure the best possible solution to this problem.

The implementation of an optimal minority distribution capability[1] into the Marine Corps' computer-based Recruit Distribution Model (RDM) established the USMC as the only service with such a capability. In continuous operational use since January 1973, this minority optimization enhancement has provided the USMC with an optimal solution to the problem of distributing minority recruits to entry-level training equitably.

The implementation of this capability was integrated with the other USMC assignment policies and objectives at that time in such a way that the full benefits of the methodology were realized.

Changes in the priorities associated with various Marine Corps goals over time, and changes in the personnel resources available, especially in the All-Volunteer Force environment, however, complicated the recruit assignment process. As a result, additional enhancements of the Recruit Distribution Model (RDM) became necessary.

Enhancements were made to the Recruit Distribution Model in 1975 to accommodate a number of policy revisions and to offset, partially, the radical cycles in both the quantity and quality of recruit accessions. One major enhancement accommodated the enlistment

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[1] Development of an Optimal Mathematical Methodology to Achieve Culture-Fair Assignment Outcomes for the Personnel Assignment Problem, Final Report, June 1973, Decision Systems Associates, Inc., Rockville, Md. (contract N00014-73-C-0334).

guarantee program and all associated assignment restrictions. DSAI also provided an algorithm for the optimal relaxation of early by-date (training arrival) restrictions to minimize the time ELT assignees spent at training locations waiting to initiate formal instruction (Personnel Awaiting Training or PAT Line). This algorithm simply replaced an expensive, ineffective, manual procedure originated at HQMC entailing repeated estimations of early by-dates and trial RDM solutions.[2]

Unfortunately, the Enlistment Guarantee Programs and the overlay constraining early by-date restrictions resulted in a significant reduction in the eligibilities of all recruits including those of the minority recruit population. The impact was substantial and had deleterious consequences for the effectiveness of other Affirmative Action Programs in the USMC.

In response to the negative impact of guarantee policies on the distribution of minority recruits across occupational fields and the undesirable method of reducing the PAT line, the contractor was awarded the present contract to optimize the PAT line without impacting on the distribution of minority accessions across occupational fields. The specific objectives, with respect to the distribution of minority recruits, were:[3]

(1) Identify and analyze personnel policies, practices, and procedures which contribute to imbalances in the distribution of minority accessions among occupational fields;

---

[2] The algorithm developed by DSAI to accomplish this objective was not required by contract and was quickly designed to fill an immediate need. The approach automated by the algorithm did not permit appropriate tradeoffs with minority distribution objectives.

[3] Plan to Monitor Assignment Actions, Interim Contract Report, January 1977 (contract number M00027-77-C-0014).

(2) Develop and implement an enhanced version of the Marine Corps' Recruit Distribution Model to accommodate certain policy changes designed to improve the distribution of minority recruits;

(3) Recommend policy and procedural changes which would improve the distribution of racial minorities while maintaining overall Marine Corps effectiveness; and

(4) Provide the Marine Corps with the capability of monitoring the distribution of minority accessions on a current and trend-type basis.

The scope of the project was limited to policies, procedures, and practices in the area of recruit assignment. This area was deemed critical with respect to the minority distribution problem, as the effects of imbalances in the assignment of the accession population rapidly extend throughout the Marine Corps due to the rapid turnover of the first-term population.

In summary, as a first priority requirement, the current contract focused upon the impact of two major assignment objectives which conflicted with one another in the achievement of equitable minority assignments across occupational fields: minority distribution optimization and PAT line minimization. The second requirement issued from the fact that minority distributions across occupational fields were not being monitored with a planned reporting system--a monitoring system designed to report initial RDM-generated minority distributions as well as to report the extent to which RDM recommendations were being implemented in the field. These requirements were corrected through the introduction of a PAT line optimization capability and the development of a reporting system to monitor RDM minority recommendations and their "persistence" one year following graduation from basic training. The reporting process is described under the acronym, SIMAAR, for Statistical Information: Minority Affirmative Action Reports.

II. REPORT OF STUDY

BACKGROUND

The single process which most profoundly affects the equitable utilization of minority Marines throughout the Marine Corps is the assignment of graduating recruits to entry-level training (ELT). Each month an average of about 3,400 graduating recruits is assigned to approximately 300 formal school classes or to on-the-job training in various skills at FMF or non-FMF commands. The problem of assigning the recruit graduates to fill all requirements is a formidable task. Many factors impact on an effective solution; the primary factor concerns the training prerequisites for tested aptitudes and other assignment relevant characteristics. The Marine Corps was a forerunner in solving this problem with the development of the Recruit Distribution Model in 1964.

As the model has evolved, changing measures of effectiveness and changing personnel policies have been instrumental in shaping the operating characteristics of the model. Initially, the assignment process was truly "color blind," and neither race nor ethnic origin were data items available to the solution. It became apparent in the early 1970's that the occupational field distribution of minorities was unacceptable, and, as a consequence, in 1972 the model was enhanced so that, within the constraints of mandatory prerequisites for assignment, minority recruits would be given either a fair or user-specified share of all assignment categories where feasible. The enhanced minority responsive RDM was used operationally for about three years providing optimal distributions of minority recruits. Although no formal records were maintained on an organized basis, it was assumed that minority recruits were in fact being recommended for and receiving assignments into all occupations on an equitable basis.

THE PROBLEM

PAT line conflicts with minority distributions became unacceptable in 1975. The procedure utilized to run RDM by the USMC aggravated the conflict as may be seen from the following. Early and late by-dates may be specified for each training quota input to the Recruit Distribution Model. The early and late by-dates are, respectively, the earliest and latest dates a recruit may arrive at a particular training location for a particular class. If his arrival, projected from his date of basic training graduation, would result in his arrival outside of these dates, he would automatically be flagged as ineligible for the training regardless of any other prerequisites he may possess. In general, the late by-date restricts eligibility to those recruits who can arrive prior to the class convening date of a formal training program. The early by-date, on the other hand, is used to restrict the maximum time a recruit may arrive prior to beginning a training program. The purpose of the early by-date is to reduce training costs associated with nonproductive waiting time chargeable to the training line. Unfortunately, in practice, the use of early by-dates disproportionately impacts on Affirmative Action Programs by restricting otherwise qualified minority personnel from assignment to hard skill training programs.

Another source of conflict was generated by the Enlistment Guarantee Programs employed by the USMC. The Enlistment Guarantee Programs serve as an additional enlistment incentive to potential recruits. Marines enlisting under these programs are assured of assignment to one or more MOS's or occupational fields selected by them at the time of enlistment. These guarantees must be honored by the Recruit Distribution Model. Obviously, if recruiters are not awarding guarantees proportionately to minority recruits, imbalances may result depending on the number and talent mix of non-guarantees assignable to the same MOS's by RDM.

Summary of the Problem

With the heightened awareness of effective manpower management, especially control over the size of the training line, and the increased use of enlistment guarantee programs to compete with the other service guarantee programs, an increasing number of constraints were imposed on the minority distribution solution. About this same time, HQMC derived an approach which established early by-dates restricting early arrival at training locations. This approach was implemented during the same general time frame that the model was modified to accept the markedly increased constraints imposed by the expanding enlistment guarantee programs.

The procedures actually utilized in accommodating the early by-date restrictions levied by the agency responsible for the training line were quite awkward, were not effecting an optimal reduction in the PAT line, and, most importantly, were having a seriously deleterious effect on the equitable distribution of minority recruits to assignment opportunities.

Furthermore, it was readily apparent that an effective monitoring capability had to be devised to track the minority distribution on both a current and trend-type basis.

APPROACH TO THE PROBLEM

A major factor in the deleterious impact on equitable minority distributions concerned the 1974-1975 early by-date restriction approach derived by HQMC--an approach implemented manually and then automated by an optimal by-date relaxation algorithm provided by DSAI at the request of HQMC. The approach operated within the QUOTFIND process, a quota fill process which precedes all other optimizations and is executed just prior to the minority distribution optimization. Thus, prior to execution of the minority optimization process, a large number of potential minority exchanges among assignment

quotas had been eliminated by the rigorous early by-date restriction approach implemented by QUOTFIND. Minority recruits otherwise eligible for hard skill formal training were rendered ineligible, solely due to their earlier-than-desired graduation dates from basic training. Often, the model manager manually and unsystematically imposed various early by-date constraints. In these cases, he probably achieved little, if any, PAT line minimization even though precluding the minority optimization algorithm a full opportunity to optimize the overall minority distribution.

DSAI recommended an approach requiring the design of a PAT line optimization algorithm implemented as an independent overlay and executed separately from the QUOTFIND module after the minority distribution optimization process. The contractor predicted this would result in a superior solution, in terms of mandays saved, to the PAT line minimization problem than the approach employed operationally at the time. Further, there would be no impact whatsoever on the minority distribution optimization.

The contractor also recommended an optional feature--that of ignoring early by-date restrictions for minority Marines only. This optional feature would protect minority eligibility in the QUOTFIND process and thus eliminate constraints on the subsequent minority optimization in the event early by-dates were employed (see gaming Series I). The elimination of all early by-date constraints for minority Marines did, in fact, improve their eligibility and raise the overall quality of the minority distribution outcome. DSAI recommends, under normal conditions, that it would seem most prudent to eliminate early by-date restrictions for all recruits unless they are in fact mandatory, such as the case in which bedding facilities cannot accommodate early arrivals. For these quotas, both minority and majority recruits should be subject to the restrictions.

To solve the second of the problems identified, that of monitoring the minority distributions both on a current and trend-type basis, the programming of SIMAAR, Statistical Information: Minority Affirmative Action Reporting System, was recommended. This enhancement, not properly the subject for detailed information in this staff study, provides an enormous array of data regarding the efficacy of the Marine Corps recruit distribution affirmative action programs. A particularly desirable feature of SIMAAR is the optional input of a user-specified, long-range minority percentage goal into the dictionary, causing RDM to calculate, automatically, a target for the run to be executed in an attempt to reach the goal as soon as possible. When this optional feature is not exercised, the long-range goal defaults to a "fair share" policy for the run.

SOLUTION TO THE PROBLEM

As a primary solution to the problem, an additional optimization capability was added. This capability minimizes the total time spent in the PAT line by all assignees. Importantly, this optimization is carried out following the optimization of minority distributions to training and, therefore, cannot alter the minority composition achieved by this prior solution.

Additionally, a minor enhancement of the Recruit Distribution Model permits waivers of all early by-date restrictions for minority recruits if requested of the model by the user.

To monitor the impact of various assignment policies and programs, a Statistical Information: Minority Affirmative Action Reporting System (SIMAAR) was developed and added to the Recruit Distribution Model. Earlier versions of the model did not conveniently report the various statistical aspects of minority distribution. Consequently, it was difficult

to monitor or evaluate the recruit assignment solutions from the standpoint of minority distribution outcomes. SIMAAR was designed to correct this deficiency by collecting and reporting data relevant to the minority distributions on a current as well as trend-type basis.

In addition to reporting on the minority distributions of the assignment solution, SIMAAR provides the data required for the automated generation of minority composition targets. Earlier versions of the Recruit Distribution Model either required the manual submission of these targets with each assignment run or the use of a "fair share" default option. The new, automated targets are computed from: (1) Marine Corps specified annual goals, and (2) the results of all assignment solutions for the year to date. These two data sources are maintained on a semi-permanent dictionary; therefore, the input data required from run to run is reduced considerably.

EVALUATION: DESIGN OF GAMING RUN STUDIES

Recruit training graduates for the month of September 1977 were selected for use in the gaming runs. First, the data collection coincided with the contract schedule, and, second, this month normally provides a pool of potential assignees in which the quantity and quality is superior to all other months of the year. As a result, improvements will have to be discounted for months in which the talent pool is inferior to that used in these studies. Importantly, however, if improvements could not be found using this month's recruit pool, then it would be most improbable that improvements could be found with data collected from any other graduation month. In summary, the optimum opportunity for improvements was exploited by the study; therefore, the improvements found may not

generalize, at least with the same magnitude, to all other recruit graduation months within the year.[4]

Characteristics of the data used for the gaming runs are provided in Exhibits 1 and 2. The two recruit depots were approximately equal in the numbers and characteristics of available recruits. In the study, data for the two Marine Corps Recruit Depots (MCRD's) were analyzed separately whenever appropriate, but combined results were provided when the overall results were unaffected by differences between depots.

GAMING RUN PLAN

The two major objectives of the first enhancement, i.e., (1) to reduce the man-months lost to the PAT line, and (2) to ensure the attainment of this objective with either an improvement or, at a minimum, with no loss to the minority distribution solution outcome, required evaluation by means of a structured gaming run plan. Such a plan was conceived to study the impact of the new PAT line minimization enhancements, their efficiency, and the extent to which they interacted or conflicted with other assignment objectives.

The gaming runs were carried out in two basic configurations for comparison with the operational (OPER) or base line runs for each depot. Where the assignment desirability (FEASFIND) optimization preceded the PAT line optimization, the gaming run was configured (FF/PAT); otherwise, the reverse configuration (PAT/FF) was used. The gaming run configuration symbols refer to the sequence in which the FEASFIND and PAT line optimizations were executed by the RDM for the particular run. It should be remembered that for all "OPER" or operational runs the policy of waiving early by-date restrictions for minority availables did not apply to the run. The operational runs were executed by the Marine Corps, and the data input to all runs, both operational and gaming, was identical.

[4] This approach to a study design is generally considered more legitimate and practical than using conditions expected to be "hostile" to the discovery of treatment effects (e.g., graduation months with inferior talent pools) and then inflating the estimates of improvement, for conditions expected to be more susceptible to the demonstration of treatment effects.

EXHIBIT 1

— DESCRIPTION OF STUDY DATA —
RECRUIT TRAINING GRADUATION

September 1977

Initial recruit population by category	MCRD PARRIS ISLAND	MCRD SAN DIEGO
Number processed	3,283	3,824
Six-month reservists (preassigned)	- 307	- 312
Direct MOS assignments	- 81	- 99
Rejected (inadequate data)	- 195	- 493
RDM AVAILABLES:	2,700	2,920
Unusable in RDM solution (excess to quotas or unqualified)	- 3	- 94
ASSIGNED BY ALLOCATORS:	2,697	2,826
Total Outpost Population:	3,283	3,824

EXHIBIT 2

— DESCRIPTION OF STUDY DATA —
DISTRIBUTION OF AVAILABLES
BY MINORITY STATUS, GUARANTEE STATUS,
AND MARINE CORPS RECRUIT DEPOT

USMC Recruit Depot	GUARANTEES, ETC.		NON-GUARANTEES		TOTAL N
	N	Minority %	N	Minority %	
Parris Island	1,596	17.98%	1,185	47.51%	2,781
San Diego	1,455	19.45%	1,564	42.26%	3,019

Note: Data includes Direct MOS (civilian acquired skills, etc.) assignments and special assignments (social security number selectees) which RDM executes as specified by input parameters. These assignments bypass the RDM optimizations but are merged with the RDM-assigned availables on the final assignment file. Data does not include six-month reservists (also not assigned by RDM allocators) although data is also merged with all other assignments on the final RDM assignment file. Data includes unusables in RDM solutions, but does not include recruits whose records have been rejected on input due to inadequate data.

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The gaming run plan was developed to study the following hypotheses:

Series I: Improved Minority Solution Outcomes

It was hypothesized that waiving early by-date constraints for minority recruits would increase minority eligibility for hard skill formal schools as well as OJT and MOJT training opportunities.

Further, it was hypothesized that the increase in minority assignment eligibility would improve the minority distribution compositions among assignment quotas.

Series II: Assignment Desirability Tradeoffs with PAT Line Reductions

It was hypothetized that the imposition of the PAT line minimization solution prior to the FEASFIND (assignment desirability optimization) solution would reduce the average desirability of assignments.

Series III: PAT Line Impact on Aptitude Optimization

It was hypothesized that the PAT line minimization solution would be significantly more efficient than the awkward manual procedures used prior to the enhancement and that the mean selection relevant aptitude score for all assignments would be lowered to some extent.

Series IV: Recruit Guarantee Program Impact on PAT Line

It was hypothesized that recruits with enlistment guarantees would be relatively impervious to improvements from the PAT line solution. Recruits assigned with civilian-acquired skills, or by Direct MOS, by-pass the model optimization modules and would, of course, not be influenced in the PAT line solution.

Series V: Minority Status/Pre-assignment Status and PAT Line Solutions

It was hypothesized that majority recruits without recruitment guarantees would be most susceptible to rearrangement in the PAT line; thus, the largest contribution to savings in average man-days would be realized from this group. Minority recruits as a group would be somewhat more constrained in their eligibility and, consequently, their susceptibility for reassignment and rearrangement in the solution to reduce the PAT line. Finally, it was hypothesized that those recruits classified in the "Guarantee, etc." group would be least able to swap assignments or rearrange arrival dates at training locations; hence, this category would contribute the smallest increment of improvement, on a per capita basis, to the savings in man-days lost by personnel awaiting training at training locations.

RESULTS OF GAMING RUNS

Series I Results — Improved Minority Solution Outcomes

Because of the large numbers of recruits graduating from each MCRD in September, quotas were filled for formal schools almost without exception. There was, therefore, very little latitude for demonstrating increased eligibility of minority recruits due to the "early by-date waiver" policy studied in these runs. To demonstrate the increase in eligibility of minority recruits as a result of this policy, therefore, a series of four hypothetical runs was designed:

- First, all majority recruits were removed from the available assignee pool.
- Second, all quotas which were structured for the operational (regular monthly) run which did not contain early by-dates--by-dates normally expected to constrain eligibility for assignment to quotas--were removed from the quota file.

- Third, all quotas were raised to 5,000.
- Fourth, the minority availables were submitted for assignment to the runs prepared for their respective depots, early by-dates present, under the three conditions above. These comprised the first two of four runs in the series.
- Fifth, the early by-dates were removed from the quotas used in the first two runs (see "Fourth" above).
- Sixth, the minority availables were then submitted once again for assignment to the runs prepared for their respective depots under the four conditions specified above; i.e., "First," "Second," "Third," and "Fifth" conditions above. These two runs comprised the final two runs in the series.

The results of these four runs, two for each depot, definitively illustrate the numbers of minority availables who were assignable to early by-date restricted quotas on the basis of all prerequisites save one, the requirement to meet early by-dates (graduation on or after a specific date). The increased eligibility allowed a "potential" 18.5% additional minority recruits to be assigned (1,415 vs. 1,194). Unusable (unassigned) recruits dropped by almost 40% for this specific data situation (558 vs. 337). The waiver of the early by-date restriction, therefore, did, in fact, improve minority eligibility. See Exhibit 3 for the results of these runs.

Improvement in Minority Distributions

To study the possible improvement in minority compositions among assignment quotas, it was necessary to compare the extent to which the assignment policy, "waiver of early by-date restrictions for minority availables," influenced the minority compositions in the assignment problem. The best criteria for evaluating which of two solutions to the composition

EXHIBIT 3

INCREASED MINORITY ASSIGNMENT POTENTIAL ASSOCIATED WITH WAIVER OF EARLY BY-DATE RESTRICTIONS

(Minority availables only)

QUALIFIED MINORITY RECRUITS ASSIGNED BY RDM TO FORMAL SCHOOLS, OJT, AND MOJT ELT QUOTAS													
	Parris Island MCRD				San Diego MCRD				Combined MCRD's				
Quota priority grouping	EARLY BY-DATE RESTRICTIONS		NO EARLY BY-DATE RESTRICTIONS		EARLY BY-DATE RESTRICTIONS		NO EARLY BY-DATE RESTRICTIONS		EARLY BY-DATE RESTRICTIONS		NO EARLY BY-DATE RESTRICTIONS		Per cent improvement* (increase)
	N	Cum. %	N	Cum. %	N	Cum. %	N	Cum. %	N	Cum. %	N	Cum. %	
1	451	53.4%	552	65.4%	511	56.3%	606	66.7%	962	54.9%	1,158	66.1%	20.4%
2	79	62.8%	59	72.4%	55	62.3%	74	74.9%	134	62.6%	133	73.7%	17.8%
3	31	66.5%	34	76.4%	61	63.0%	84	84.1%	92	67.8%	118	80.4%	18.6%
4	1	66.6%	0	76.4%	0	63.0%	0	84.1%	1	67.9%	0	80.4%	18.5%
5	3	66.9%	3	76.8%	2	63.2%	3	84.4%	5	68.2%	6	80.8%	18.5%

UNUSABLE MINORITY RECRUITS UNASSIGNABLE TO ANY QUOTA SOLELY DUE TO ELIGIBILITY													Per cent improvement* (decrease)
	N	%	N	%	N	%	N	%	N	%	N	%	
Unusable guarantees	150	17.8%	125	14.8%	149	15.9%	102	10.7%	299	17.1%	227	13.0%	24.1%
Unusable non-guarantees	129	15.3%	71	8.4%	130	13.9%	39	3.7%	259	14.8%	110	6.3%	57.5%
Total unusables	279	33.1%	196	23.2%	279	30.7%	141	15.5%	558	31.8%	337	19.2%	39.6%

Parris Island N = 844
San Diego N = 908
Combined MCRD's N = 1,752

* Per cent improvement (increase) refers to combined MCRD's fill under "early by-date restrictions" vs. their fill under "no early by-date restrictions." Per cent improvement (decrease) refers to the reduction in the number of unusables for the combined MCRD's for the same two categories.

problem is superior involves comparisons between minority composition percentages obtained by a solution with minority composition "target" percentages sought by the solution. The sums of squares of these percentage differences (obtained minority composition as a per cent of quota fill minus the target minority composition as a per cent of quota fill) provides excellent data for evaluating two outcomes in which all other variables have been held constant. In this case, the identical recruit input records were used; only the "minority by-date waiver" policy was varied. The algorithm employed by RDM to optimize the minority distribution provides an optimal solution to the problem of minimizing the sum of squared deviations of solution composition percentages from "target" composition percentages on a quota by quota basis.

Exhibit 4 provides the sums of squared deviations by MOS for both operational (OPER) and ENHANCED solutions for each depot and for the combined depots. As the algorithm provides an optimal minimum of squared deviations, the results demonstrate that the increase in minority eligibility resulted in a decrease in squared deviations of the solution percentage compositions from the target fair share percentage compositions. It should be remembered that all solutions are optimal, although the "enhanced" solutions have slightly more room for rearrangement of minorities to achieve better adherence to target percentage compositions; thus, the high degree of similarity in each of the pairs of solutions (SD vs. PI) compared.

Appendix B provides a detailed breakdown of minority composition results for the gaming runs as compared with the operational runs. This data is broken down by depot, occupational field, and guarantee status. Data is also provided for both depots combined.

EXHIBIT 4

— RESULTS OF MINORITY POLICY OPTIMIZATION —

SUMS OF SQUARES OF PERCENTAGE DEVIATIONS FROM MOS MINORITY COMPOSITION TARGETS BY RUN TYPE AND MARINE CORPS RECRUIT DEPOT

Run type	Number of RDM MOS assignments*	Sum of squared percentage deviations from composition targets by MOS**
Parris Island: OPER.	2,781	64,177.19
Parris Island: ENHANCED	2,781	63,791.94
San Diego: OPER.	3,019	38,382.66
San Diego: ENHANCED	3,019	38,316.50
Combined: OPER.	5,800	56,126.90
Combined: ENHANCED	5,800	54,403.33

* Assignments include Direct MOS assignments and exclude only six-month reservists and recruit records rejected for inadequate data (see Exhibits 1 and 2).

** All composition targets were based on a "fair share" percentage of minorities present in the recruit pool of available assignees.

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Series II Results — Assignment Desirability Tradeoffs with PAT Line Reductions

The order in which the FEASFIND optimization--assignment desirability as defined on the Dictionary--and the PAT line optimization are executed by RDM will influence fairly dramatically the outcome of the two solutions. These two assignment objectives conflict with one another; thus, the enhancement was incorporated in a flexible way permitting the user to specify the sequence of optimizations from run to run if need be. The extent to which the two objectives constrain one another, depending on optimization order, may be seen from Exhibits 5 and 6.

Exhibit 5 demonstrates the impact on the optimization of assignment desirability when constrained (PAT/FF) and when unconstrained (FF/PAT) by PAT line optimizations. It should be noted that runs labeled FF/PAT or PAT/FF differ from those labeled OPER (operational) in that the FF/PAT and PAT/FF runs were conducted using the early by-date waiver for minority availables. However, this additional slack in the solution was absorbed, to some extent, by the minority distribution optimization which always precedes both the FEASFIND and PAT line optimizations.

As expected, runs in which the FEASFIND optimization preceded the PAT line optimization (FF/PAT) produced more desirable assignments as defined by the assignees' ability to satisfy desirable prerequisites over and above the mandatory prerequisites. For those runs in which the PAT line optimization preceded the FEASFIND optimization (PAT/FF), the number of assignees meeting only the mandatory prerequisites associated with the quotas to which they were assigned (quotas for which desirable prerequisites were specified) increased approximately 18.6%. In addition, for those runs in which the PAT line optimization preceded the FEASFIND optimization (PAT/FF), the desirability of assignments dropped noticeably. On the average 10% fewer assignees to quotas possessing desirable prerequisites could meet the desirable prerequisites associated with a randomly selected desirability level in their quota; this may be seen from the last column in Exhibit 5.

EXHIBIT 5

— RESULTS OF FEASFIND OPTIMIZATIONS —

ANALYSIS OF DESIRABILITY OF ASSIGNMENTS
BY FEASFIND LEVEL, RUN TYPE, AND MARINE CORPS RECRUIT DEPOT

Run identification	Per cent of assignees to quota possessing the prioritized FEASFIND level which also satisfy all desirable prerequisites specified for the level										Index of Level Satis-faction**
	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7	Level 8	Level 9	M*	
Parris Island: OPER.	71.33%	72.87%	70.32%	67.26%	62.78%	59.40%	71.93%	79.41%	38.24%	17.51%	69.60% N=2041
Parris Island: FF/PAT	71.38%	73.32%	70.44%	67.44%	61.79%	58.97%	73.68%	79.41%	38.24%	17.71%	69.66% N=2041
Parris Island: PAT/FF	64.53%	62.78%	62.43%	63.52%	50.87%	49.15%	80.70%	79.41%	38.24%	21.09%	62.09% N=2041
San Diego: OPER.	67.72%	64.47%	63.19%	73.51%	65.57%	69.08%	80.30%	90.24%	68.29%	18.30%	67.15% N=2059
San Diego: FF/PAT	67.77%	64.18%	63.09%	73.18%	66.27%	68.67%	78.79%	90.24%	68.29%	18.02%	67.08% N=2059
San Diego: PAT/FF	62.33%	57.12%	56.87%	66.56%	55.90%	54.62%	80.30%	87.80%	68.29%	21.27%	60.46% N=2059

* Per cent of mandatory level (M) assignments for all quotas for which one or more desirable levels had been specified; level one is the most desirable level.

** Weighted average probability of any given assignee meeting any given desirable level specified for the training quota to which he is assigned; computed only for those recruits assigned to quotas for which desirable levels have been specified.

NOTE: A total of 1,423 availables were assigned to quotas for which no desirable levels had been specified; Parris Island, N = 656; San Diego, N = 767. These 1,423 recruits, as well as 97 unusables, have been eliminated from data.

EXHIBIT 6

— RESULTS OF PAT LINE OPTIMIZATION —

ANALYSIS OF PAT LINE MAN-DAYS
BY EARLY ARRIVAL CATEGORIES, RUN TYPE,
AND MARINE CORPS RECRUIT DEPOT

Run identification	Number of Assignees *	Cumulative Percentage of Assignees by Days Early Arrival in PAT Line						Total Man-Days in PAT Line	Average Man-Days in PAT Line
		0-3	4-6	7-9	10-12	13-15	16-31+		
Parris Island: OPER.	1,616	38.4	53.8	71.8	82.9	88.3	100.0	11,502	7.12
Parris Island: FF/PAT	1,616	40.7	57.0	75.7	85.7	89.3	100.0	10,639	6.50
Parris Island: PAT/FF	1,616	48.4	66.6	80.2	88.1	90.4	100.0	9,083	5.62
San Diego: OPER.	1,896	43.5	67.9	81.1	91.4	94.5	100.0	11,673	6.16
San Diego: FF/PAT	1,896	47.6	72.2	85.2	93.6	94.9	100.0	10,634	5.61
San Diego: PAT/FF	1,896	53.5	77.6	88.0	94.4	95.5	100.0	9,372	4.94

* Data includes only those recruits (N=3,512) assigned to quotas for which by-dates were specified; i.e., assignment opportunities for which the PAT line concept had relevance.

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The Index of Level Satisfaction provides a weighted average probability that an assignee to a quota (for which desirable prerequisites have been specified) will meet all the prerequisites specified for a randomly selected desirable (non-mandatory prerequisite) level.

Judgments as to the extent to which assignment desirability was adversely influenced as the result of according PAT line optimization a higher priority (PAT/FF) must be made with expert knowledge of the predictive power (validity) of the desirable prerequisites specified, and this, in turn, weighed against savings in mandays which would otherwise be lost in the PAT line were the optimization order reversed (FF/PAT).

Exhibit 6 provides breakdowns by depot of PAT line mandays expended for the three gaming run configurations: OPER, FF/PAT, and PAT/FF. These data have been subdivided into three-day increments, and the cumulative percentage of arrivals calculated until the earliest arrivals have been included in the percentage. The PAT line minimization, even if executed following FEASFIND (FF/PAT), provides a dramatic savings of mandays lost to the PAT line. The maximum (PAT/FF) savings potentially exceed 20%. Given 40,000 annual recruit accessions, and estimating that approximately 50% are assigned to quotas with PAT line savings potential, the maximum estimate of mandays saved exceeds 26,000. The savings in dollars for these figures is not estimable by the contractor. Further, the savings are inflated to an unknown degree by the use of September as the data collection month.

Series III Results — PAT Line Impact on Aptitude Optimization

A loss in the mean relevant selection aptitude score for all assignees results from the additional constraints generated by exercise of the minority by-date waiver and by the PAT line optimization. The following table provides the exact loss in this "difficult to interpret" index:

TABLE 1

	PARRIS ISLAND (N=2,697)*			SAN DIEGO (N=2,826)*		
	OPER	FF/PAT	PAT/FF	OPER	FF/PAT	PAT/FF
Mean selection relevant aptitude score	107.004	106.694	106.654	106.869	106.576	106.245

* Data includes all recruits assigned via RDM's optimizing algorithms (see Exhibit 1). Note that this is a larger population than that on which the PAT line comparisons are based (see Exhibits 6, 7, 8, and 9). This is due to the removal, for PAT line solution comparisons, of assignees to quotas for which no early by-dates had been specified (see Exhibit 6 footnote).

Given the limited degree to which personnel research specific to USMC formal schools and OJT programs has been carried out, the validity of these predictors is questionable. It is probably reasonable to conclude that the losses in mean selection relevant aptitude as the result of incorporation of the PAT line optimization into RDM are relatively insignificant. Therefore, this tradeoff in the attainment of assignment objectives would appear acceptable.

Series IV and V Results — Minority Status/Pre-assignment Status and PAT Line Solutions

Exhibit 7 provides PAT line mandays savings by minority-majority breakdowns within the two depots as influenced by the gaming run configurations. Exhibit 8 presents the PAT line savings as a function of gaming run configuration broken out by guarantee vs. non-guarantee status within each depot. Finally, Exhibit 9 provides a breakout of the PAT line savings, summarized over depots, by guarantee status, minority status, and gaming run configuration.

From these data, it will be observed that the major contribution to savings in PAT line mandays accrues from majority, non-guarantees. Although guarantees out-number non-guarantees in a ratio approximately 22:13, non-guarantees contribute more savings in

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EXHIBIT 7
— RESULTS OF PAT LINE OPTIMIZATION —
ANALYSIS OF TOTAL PAT LINE MAN-DAYS
BY MINORITY STATUS, RUN TYPE, AND
MARINE CORPS RECRUIT DEPOT

Run identification	Minority Status	Number Assigned	Total Man-Days in PAT Line	Average Man-Days in PAT Line
Parris Island: OPER.	Minority	393	2,279	5.80
	Majority	1,223	9,223	7.54
Parris Island: FF/PAT	Minority	391	2,084	5.33
	Majority	1,225	8,555	6.98
Parris Island: PAT/FF	Minority	391	1,632	4.17
	Majority	1,225	7,451	6.08
San Diego: OPER.	Minority	482	2,596	5.39
	Majority	1,414	9,077	6.42
San Diego: FF/PAT	Minority	482	2,358	4.89
	Majority	1,414	8,276	5.85
San Diego: PAT/FF	Minority	482	2,196	4.56
	Majority	1,414	7,176	5.07

EXHIBIT 8
— RESULTS OF PAT LINE OPTIMIZATION —
ANALYSIS OF TOTAL PAT LINE MAN-DAYS
BY GUARANTEE STATUS, RUN TYPE, AND
MARINE CORPS RECRUIT DEPOT

Run identification	Guarantee Status	Number Assigned	Total Man-Days in PAT Line	Average Man-Days in PAT Line
Parris Island: OPER.	Guarantee	1,138	9,362	8.27
	Non-Guarantee	478	2,140	4.48
Parris Island: FF/PAT	Guarantee	1,136	8,870	7.81
	Non-Guarantee	480	1,769	3.69
Parris Island: PAT/FF	Guarantee	1,113	7,981	7.17
	Non-Guarantee	503	1,102	2.19
San Diego: OPER.	Guarantee	1,057	7,590	7.18
	Non-Guarantee	839	4,083	4.87
San Diego: FF/PAT	Guarantee	1,036	7,119	6.87
	Non-Guarantee	860	3,515	4.09
San Diego: PAT/FF	Guarantee	1,014	6,703	6.61
	Non-Guarantee	882	2,669	3.03

EXHIBIT 9

— RESULTS OF PAT LINE OPTIMIZATION —

ANALYSIS OF TOTAL PAT LINE MAN-DAYS
SUMMARIES BY MINORITY STATUS, GUARANTEE STATUS,
AND RUN TYPE FOR COMBINED DEPOTS

Run identification	PAT Line Parameters	GUARANTEES, ETC.			NON-GUARANTEES			TOTAL AVAILABLES		
		Minority	Majority	Total	Minority	Majority	Total	Minority	Majority	Total
OPERATIONAL RUN	Number assigned	379	1,816	2,195	496	821	1,317	875	2,637	3,512
	Man-days	2,636	14,316	16,952	2,239	3,984	6,223	4,875	18,300	23,175
	Average man-days	6.96	7.88	7.72	4.51	4.85	4.73	5.57	6.94	6.60
FF/PAT	Number assigned	372	1,800	2,172	501	839	1,340	873	2,639	3,512
	Man-days	2,540	13,449	15,989	1,902	3,382	5,284	4,442	16,831	21,273
	Average man-days	6.83	7.47	7.36	3.80	4.03	3.94	5.09	6.38	6.06
PAT/FF	Number assigned	359	1,768	2,127	514	871	1,385	873	2,639	3,512
	Man-days	2,225	12,459	14,684	1,603	2,168	3,771	3,828	14,627	18,455
	Average man-days	6.20	7.05	6.90	3.12	2.49	2.72	4.38	5.54	5.25

total mandays by almost 10% over savings made by guarantees. Overall, the savings, under the most favorable run configuration (PAT/FF), exceed 20%. Under the least favorable run configuration (FF/PAT), the savings in PAT line mandays exceed 8%. These savings occur in the presence of a slight improvement in the minority distribution outcome, but at a loss in the desirability of assignments for the 20% savings configuration (PAT/FF). The loss in mean selection relevant aptitude due to introduction of PAT line minimization would appear to be relatively minor and acceptable.

CONCLUSIONS

The latest enhancements to the RDM provide successful solutions to the recruit distribution problems which have surfaced in the past several years. To recap, these enhancements allow:

- an optional waiver of early by-dates for minority recruits,
- an optimal PAT line minimization module independent of the QUOTFIND process and subject to optimization sequence control,
- the capability to set minority distribution goals either monthly or cumulative yearly and either accommodate these user-specified percentages or default to a fair-share policy, and
- an effective means to monitor current and cumulative recommended minority distributions as well as the distribution actually reported in the MMS at some later date.

As discussed earlier in the report, the entire recruit distribution process involves an interplay of the relationships among various utility measures and characteristics of the population as well as accommodation of the policies, often conflicting, input by HQMC agencies involved in the management of manpower functions. Total quota fill, priority of

training quotas, equitable minority distribution, management of the PAT line, and quality of the recruits filling the various quotas all must be considered and given a relative priority in the solution outcome. The newly enhanced model gives precise control to the managers, allowing maximum accommodation of policy configurations, once approved.

The results of the study and its gaming runs indicate:

(a) It is possible to improve minority distributions to MOS quotas through selection of the option to waive early by-date constraints for minorities;

(b) The minority distribution has also been improved through execution of the PAT line minimization after execution of the minority optimization solution;

(c) Significant PAT line savings are possible, at least for those months for which sufficient talent exists to permit a reasonable tradeoff among assignment policies; however, some savings should occur for all assignment outcomes, even in "talent poor" recruit procurement months;

(d) The degradation to desirability optimization and aptitude optimization is fairly minimal even if the PAT line minimization precedes the assignment desirability (FEASFIND) optimization; and

(e) The impact of recruiter use of the enlistment guarantee programs has a significant negative impact on minority distribution and PAT line minimization outcomes, in addition to the remaining assignment objectives optimized by the system.

RECOMMENDATIONS

DSAI recommends the use of a carefully analyzed configuration of assignment options with significant impact on the successful achievement of USMC policies and goals, especially in the area of minority affirmative action programs. Additional areas impacted upon by DSAI's recommendation entail the negative impact of the rapidly expanding recruiter guarantee programs on the quality of assignments achievable by RDM.

The contractor has been involved intimately with the thirteen-year evolution of the RDM, has a thorough understanding of the problems associated with the recruit cycle and its talent implications, the formal school training quotas generation and fill problem, and the unusable/unassignable recruit distribution problems. As a consequence, the contractor willingly presents the following "technical" recommendations with appropriate rationale, fully cognizant that responsibility for approval or rejection of these recommendations rests solely and appropriately with Headquarters, U.S. Marine Corps.

DSAI recommends the following:

(a) Elimination of the use of early by-date constraints, except where absolutely necessary, and in these cases the option to waive early by-dates for minority recruits should not be exercised. The use of early by-dates should be limited to quotas for which arrival prior to a specified date will result in severe disruption of operations due to the absence of facilities. There is, for approximately nine months of the year, a severe difficulty in filling higher quality and higher priority hard skill training quotas; therefore, the entire month's pool should be considered. The PAT line minimization module is optimal so that it will provide the least possible waste of trainees in PAT line

status. The gaming runs indicate a considerable savings, and, therefore, PAT line status, when apparently higher than expected, will occur only when higher priority objectives must be satisfied at the expense of the PAT line. This would occur only to achieve fill objectives and minority distribution objectives.

(b) The PAT line minimization should be executed before the FEASFIND (assignment desirability) optimization, at least in those months for which a reasonable pool of talent exists.

(c) For appearances and credibility, it would probably be best to minimize the very long waits (MINIMAX) as opposed to maximizing the relatively short training waits (MAXIMIN), but the two outcomes do not produce significantly different savings in mandays.

(d) Although there would be more "slack" reserved for subsequent desirability and aptitude optimizations if two or more series were included in each surface relaxation executed by the PAT line solution, the marginal improvement gained thereby is probably not significant. Therefore, until such time as the desirability levels and aptitude relevant scores have been revalidated, it is recommended that the PAT line successive surface relaxation logic optimize one additional series at a time.

(e) A review of "late by-dates" should be made to determine which training quotas really required late by-dates and which training quotas use the dates artificially. BEC, for example, has a PAT line sufficiently large that recruits are entered into classes on a first-in, first-out (of the PAT line) basis, and the late by-date associated with the RDM assignment is, in most cases, irrelevant to the class to which the recruit is assigned.

III. ENHANCEMENTS AND SYSTEM MODIFICATIONS

SYSTEM MODIFICATIONS

The following enhancements were completed:

- RDM was modified to provide an optimal PAT Line Minimization capability.
- The Statistical Information Module for Affirmative Action Reporting (SIMAAR) was incorporated into RDM. SIMAAR provides the capabilities for:
  (1) The collection and reporting of minority distribution data, and
  (2) The collection and reporting of the "longevity or persistence" of RDM MOS assignments after one year.
- RDM was modified to provide an automated capability for generating minority composition target percentages for all training assignment quotas.
- RDM was modified to provide the capability for waiving early by-date prerequisites for all minority recruits.
- The RDM User's Guide was augmented to provide deck set-up examples for the condensation of historical assignment data that will reduce tape rental expenditures.

The enhancements mentioned above required the following internal RDM modifications:

— The RDM system driver overlay was modified to provide linkage to and cause the execution of the SIMAAR overlays.

— The RDM control card processor overlay was modified to accommodate the additional RDM control cards necessitated by these enhancements. The control cards are of two types:

(1) Master System Control Cards. The $PATMIN control card instructs RDM to perform PAT Line Minimization and specifies minimization options. The $XCPMIN control card directs RDM to waive early by-date prerequisites for all minority recruits. The $BOUNDS control card defines the upper limit to which the automatically generated minority composition target percentages may be set.

(2) The SIMAAR control deck. The *SIMAAR control card represents the beginning of the SIMAAR control deck and causes flags to be set instructing RDM to execute the SIMAAR overlays. Other control cards comprising the SIMAAR control deck are used (1) to define or modify the minority composition annual goals, (2) to cause the Affirmative Action Program Statistical Information Report to be written, and (3) to cause the SIMAAR Assignment Discrepancy Report to be written.

— The RDM training assignment quota card processor overlay was modified to compute minority composition target percentages for all training assignment quotas.

— The RDM data processor overlay was modified to provide data to be used by the SIMAAR overlays. The data provided consist of the recruit classification--guarantee/non-guarantee and minority/majority--as determined at the time of the assignment run.

- The RDM matrix generator overlay was modified to accommodate the option to waive early by-date prerequisites for all minority recruits.
- A special algorithm to provide an optimal minimization of the size of the PAT Line was designed and added to the RDM model. The new algorithm provides the capability to minimize the PAT Line either before or after FEASFIND.
- The RDM report generator overlay was modified to produce the PAT Line Report.
- Programs to generate and maintain SIMAAR data bases and to provide SIMAAR reports were added to RDM. The SIMAAR programs are organized by function and are physically structured into three overlays:
  (1) A driver overlay which directs the execution of SIMAAR and supplies utility subprograms common to the remaining SIMAAR overlays.
  (2) An overlay to provide for the collection and reporting of minority distribution data. Definition of minority composition annual goals is accomplished in this overlay.
  (3) An overlay to provide for the collection and reporting of assignment discrepancy data.

In addition to the internal RDM modifications described above, extensive changes were made to the RDM User's Guide/Technical Report.

PAT LINE MINIMIZATION

The Recruit Distribution Model has been successful in ensuring that recruits assigned to entry-level training courses arrive at training locations in time to meet the class convening dates for their courses. However, large PAT lines could result as no restrictions were normally placed against the number of days which recruits could arrive prior to class convening dates.

The manual trial-and-error specification process utilizing early by-dates to limit the PAT lines resulted in overly constraining the eligibility of the recruit input with small reductions in the PAT line. Moreover, the process increased computer expenses because successive QUOTFIND runs were made in which the early by-dates for one or more of the assignment categories were backed off one outpost date at a time until all quotas were met or until all early by-dates had been eliminated. Often twenty or thirty QUOTFIND runs were required.

The incorporation of the Early By-date Selection Algorithm[5] into the model in 1975 eliminated the necessity to make multiple QUOTFIND runs to "find" feasible early by-dates. The algorithm selects, optimally, the best feasible set of early by-date constraints for the mix of assignment quotas submitted with the run. While feasibility is assured, reductions to the PAT line are achieved at the expense of introducing excessive constraints to recruit eligibility.

The PAT line minimization algorithm[6] incorporated under the current contract ensures optimality and eliminates the mandatory eligibility constraints introduced prior to optimization of the minority distribution objectives. Thus, this algorithm achieves a mathematically optimal reduction in the PAT Line without influencing the eligibility of the available minority recruit input in any way.

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5 Appendix G, "Early by-date selection algorithm," USMC Computer-Based Recruit Distribution Model (RDM), User's Guide/Technical Report, contract M00027-77-C-0014, September 1977 (see footnote 2).

6 Algorithm Design Report for Personnel Awaiting Training (PAT) Line Minimization, contract M00027-77-C-0014, February 1977.

PAT Line Algorithm Characteristics

The PAT Line Minimization algorithm utilizes DSAI's specialized versions of the Ford-Fulkerson primal-dual network flow algorithm to achieve a mathematically optimal minimization of the PAT Line. This is accomplished by the optimization of a series of explicit, binary matrices employing the sequential surface optimization technique. The series of matrices is sequentially structured so as to maximize the assignment of recruit graduates chosen from the latest eligible outpost dates. Thus, assignments involving recruit graduates resulting in projected arrival dates closest to, but always prior to, the class convening dates will be maximized. This approach requires one less surface optimization than the number of outpost dates present in an assignment period.

Importantly, the PAT Line Minimization solution does not alter in any way the feasible quota structure obtained by QUOTFIND or the composition of minorities achieved by the minority distribution policy optimization solution. Both solutions precede the PAT line solution.

RDM provides the capability for selecting from the following PAT Line minimization control card options:

- Choice of minimization objective
- Choice of optimization sequence
- Size of the minimization window.

1. Choice of minimization objective

The choice consists of selecting one of two objectives:

(1) Minimize the number of recruit assignments with disproportionately large contributions to the PAT Line (MINIMAX).

(2) Maximize the number of recruit assignments with disproportionately small contributions to the PAT Line (MAXIMIN).

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Optimization solutions for the two objectives will not result in the same total number of mandays lost to the PAT Line. MINIMAX will result in a maximum reduction in embarrassingly long PAT Line assignments, but also should result in a slightly smaller number of very short PAT Line assignments than MAXIMIN. On the other hand, MAXIMIN will result in a maximum increase in the number of highly desirable short PAT Line assignments, but should also result in a slightly larger number of embarrassingly long PAT Line assignments than MINIMAX.

2. Choice of optimization sequence

The choice consists of selecting PAT Line Minimization to occur:

(1) Prior to the FEASFIND policy optimizations; or

(2) Following the FEASFIND policy optimizations.

Choosing the first sequence will result in a smaller PAT Line than choosing the second sequence. However, there would be some sacrifice to the talent fit (number of desirable assignments) under the first option due to the additional constraints passed on to FEASFIND from the PAT Line solution.

3. Size of the minimization window

The minimization window is defined in terms of outpost dates and limits the degree of minimization. Setting the window to "one" instructs the PAT Line Minimization algorithm to initiate optimization at the latest outpost date that permits timely arrival for the corresponding class convening date and, using MAXIMIN for example, to proceed backwards from this latest acceptable outpost date to the earliest, to optimize the graduates from one additional outpost date at a time. Setting the window to "two" instructs the algorithm to initiate optimization at the two latest acceptable outpost dates and to proceed backwards two additional outpost dates at a time. Likewise, when the window is set to "three," three additional outpost dates are optimized together with each new surface. Obviously, the larger the window, the less

PAT Line mandays saved, but the more "slack" preserved in the problem for subsequent optimizations.

Personnel Awaiting Training (PAT) Line Report

The PAT Line Report presents data for each assignment quota for which a class convening date has been specified. This includes Standard Training Assignment and Special Assignment quotas, as these categories of equotas are the only ones for which class convening dates may be specified. Assignment quotas having no class convening dates will not be included in the PAT Line Report. Generation of the report accompanies each assignment solution, whether or not PAT Line Minimization has been specified by the user.

The PAT Line Report provides the assignment symbol, MCC, class convening date, the number of recruits assigned to the assignment symbol, the distribution of days in the PAT Line, the total mandays in the PAT Line, and the average mandays in the PAT Line for each assignment category. Importantly, Direct MOS and special assignments must be honored and are assigned without PAT Line Minimization. These assignments are not subject to influence by the RDM solution, but bypass the algorithm. Therefore, the number of recruits assigned, the distribution of days in the PAT Line, the total mandays in the PAT Line, and the average mandays in the PAT Line are reported separately for non-guarantees and for guarantees, etc. Direct MOS and recruits assigned via Special Assignment Quotas are reported within the guarantees, etc., category. Both classes of assignee are further subdivided into two types of assignee, minority or majority. A summary of all solution information relating to the PAT Line Minimization outcome is also presented.

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STATISTICAL INFORMATION: MINORITY AFFIRMATIVE ACTION REPORTING

The incorporation of the Minority Distribution Policy Optimization[7] capability into the Recruit Distribution Model in 1972 established the U.S. Marine Corps as the first and only service with the capability of ensuring the equitable distribution of minority recruits throughout all entry-level training skills.

In 1975, the model was enhanced to allow for an unlimited number of enlistment guarantee program assignment restrictions. As pointed out earlier, DSAI modified RDM to select, automatically, an optimal set of early bydates for quotas requesting them. The enlistment guarantee programs and the early bydate restrictions served to decrease the size of the PAT Line by reducing severely the eligibility of recruits for formal school training. The methodology employed resulted in an inadvertant priorizing of the PAT Line Minimization policy over minority distribution policies. The approach was implemented solely to solve an immediate problem prior to system enhancement via contract.

Once the impact of the Enlistment Guarantee Programs and the early bydate restrictions upon minority distribution policies had been investigated, there existed reasonable evidence that the impact was substantial and impacted negatively on minority distribution policies within the USMC. A major reason the impact was not immediately apparent resulted from the absence of a minority recruit assignment monitoring capability. Such a capability has been designed into the Statistical Information: Minority Affirmative Action Reporting System (SIMAAR).[8]

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[7] Appendix H, "Minority distribution policy optimization algorithm," USMC Recruit Distribution Model (RDM), User's Guide/Technical Report, contract M00027-77-C-0014, September 1977.

[8] SIMAAR Design Report, contract M00027-77-C-0014, March 1977.

SIMAAR Operations

The basic objective of SIMAAR is to provide timely information that will assist the Marine Corps' Affirmative Action Program to meet long-term minority composition goals To accomplish this objective, SIMAAR must perform two tasks:

(1) The collection and reporting of data relevant to minority distributions obtained for the current month's assignment runs as well as cumulative statistics for all assignments for the year to date.

(2) The collection of data that will provide a basis for comparing the MOS assignments originally recommended by RDM with the actual MOS carried as a primary by the Marine one year later.

Collection and reporting of minority distribution data

The first step necessary for the collection and reporting of minority distribution data is the initialization of the SIMAAR Year-to-Date Summary File. This file contains annual minority composition goals and, through successive RDM assignment runs, data summarizing the MOS assignments recommended by RDM during the calendar year.

Initialization is accomplished via submission of the Marine Corps' minority composition goals punched onto the Annual Goals Definition Cards.

In the event that one or more of the annual minority composition goals are incorrectly established on the SIMAAR Year-to-Date Summary File, it is not necessary to reinitialize the complete file. Provisions for the modification of the annual goals which are simple and convenient will allow these modifications to be made either as a separate run or as a part of the SIMAAR run. In either case, the modifications to the annual goals will occur prior to the execution of the SIMAAR Affirmative Action Program Statistical Information Report programs.

The omission of an annual goal percentage for an MOS to which RDM will recommend assignments is not catastrophic to the successful operation of the model. Any quota for which no annual goal has been defined will be assigned the target percentage specified in the quota card or, if no target percentage has been specified, will be assigned a fair-share percentage in accordance with the actual minority composition of the recruit pool for the month.

Under normal operating conditions, data pertaining to the distribution of minority recruits to entry-level training assignments is collected and reported each month following the successful completion of the Parris Island and San Diego recruit assignment runs. The data collected include the assignments recommended by RDM for all recruits transmitted via RD1 recruit data tapes for input to the model with the exception of six-month reservists.

The input requirements are:

- the Parris Island assignments tape
- the San Diego assignments tape
- the Assignment Text Dictionary Tape
- the SIMAAR Year-to-Date Summary tape
- such SCOPE and RDM control cards as are necessary for the execution of the SIMAAR Affirmative Action Program Statistical Information Report programs and the disposition of the generated output.

The output consists of a report displaying the outcome for the month just concluded as well as year-to-date totals and an updated SIMAAR Year-to-Date Summary Tape.

The SIMAAR Affirmative Action Program Statistical Information Report programs first input the Assignment Text Dictionary and extract the assignment symbol-to-MOS conversion table.

Next, the Year-to-Date Summary tape is input. Contained on this tape are the annual minority composition goals by MOS and year-to-date assignment summary data for both recruit depots.

The main procedure for collecting and reporting the monthly data is concerned with the processing of the two assignment tapes, extracting the assignment symbols to which recruits are assigned, converting the assignment symbols to MOS's, and tabulating the number of recruits assigned to each MOS. This procedure includes the updating of the Year-to-Date Summary data.

Conversion of assignment symbols to MOS's is accomplished through the use of the assignment symbol-to-MOS conversion table extracted from the Assignment Text Dictionary.

The number of recruits assigned to each MOS is tabulated (for both the monthly totals and the year-to-date totals) by recruit depot (Parris Island, San Diego and combined), assignee type (minority, majority, total) within recruit depot, and guarantees, etc./non-guarantees within assignee type. Recruits assigned to Direct MOS Assignment or Special Assignment quotas are reported in the "guarantees, etc." category. Totals are also reported by occupational field for all assignments, and a grand total, aggregated together for assignments, is provided.

Assignment Discrepancy Data

The collection and reporting of assignment discrepancy data is also performed on a monthly basis. The data to be collected includes the assignments recommended by RDM for all recruits appearing on the RD1 recruit data tapes input to the model. Again, six-month reservists are not included in the data. This is consistent with the minority distribution data collection procedures described above.

The input requirements for the SIMAAR Assignment Discrepancy Report runs are:

- the Parris Island assignments tape
- the San Diego assignments tape
- the Assignment Text Dictionary tape
- the SIMAAR Year-to-Date Assignment Discrepancy tape
- an extract of the MMS displaying social security numbers and primary MOS's for the recruit graduates one year after recruit graduation
- such SCOPE and RDM control cards as are necessary for the execution of the SIMAAR assignment discrepancy report programs and the disposition of the generated output.

The report generated summarizes, on a year-to-date basis, a comparison between the recommended MOS's and the primary MOS s as well as a comparison between the recommended OccField and the primary OccField as displayed on the MMS one year after recruit graduation.

The procedure for the collecting and reporting of this data is similar to the procedure described above for the SIMAAR Affirmative Action Program Statistical Information Report.

The data reported for the monthly totals consists of four categories:

(1) The number of recruits assigned to the MOS from each recruit depot.

(2) The number and per cent of guarantees by type of assignee (majority/minority) assigned to each MOS. Recruits assigned to Direct MOS and Special Assignment quotas are classified and reported with guarantees.

(3) The number and per cent of non-guarantees by type of assignee (majority/minority) assigned to each MOS.

(4) The aggregate minority distribution target per cent for the MOS, and the actual minority composition of recruits assigned to the MOS.

The aggregate minority target per cent for an MOS composed of many assignment symbols is computed as follows:

$$AT_i = \frac{\sum_{k=1}^{K} (T_k N_k)}{\sum_{k=1}^{K} N_k} \quad \text{for } k=1,2,\ldots,K \text{ (number of quotas for MOS}_i\text{)}.$$

where:

AT_i = aggregate target per cent for MOS_i

T_k = target percentage for quota k

N_k = total number of recruits assigned to quota k.

In the event that T_k is a fair-share target, it will be defined as the percentage of minority recruits contained in the recruit pool for the applicable recruit depot. Recruits assigned via the Direct MOS and Special Assignment quotas are not included in the calculations of the aggregate minority targets.

The data reported for the year-to-date totals consists of the actual percentage of minorities achieved year to date and the annual minority composition goals.

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SIMAAR Assignment Discrepancy Report

This report is produced by SIMAAR on a monthly basis. The report is designed to assist affirmative action program monitors in comparing RDM MOS recommendations for each recruit with the actual primary MOS carried by the recruit as recorded on the MMS one year after recruit graduation. The report summarizes the comparisons on a cumulative year-to-date basis.

The report is organized by the MOS recommended by the RDM and subdivided by recruit depot (Parris Island, San Diego, combined), assignee type (minority, majority, total) and enlistment category (guarantees, non-guarantees, total). OccField totals and a grand total for all recruits assigned are provided. The report also provides recommended OccField comparison results and an OccField total in the same format as the result of MOS recommendations.

GENERATION OF MINORITY COMPOSITION TARGETS

The implementation of the Minority Distribution Policy Optimization algorithm into the Recruit Distribution Model in 1972 provided the U.S. Marine Corps with the capability to ensure the equitable distribution of minority recruits throughout all entry-level training skills. The minority distribution algorithm requires a minority composition target percentage for each training assignment quota. These target percentages have been supplied either manually or have been allowed to default to a fair-share target.

In either case, the target percentage was relevant only to the current assignment run. No provision existed for systematically monitoring the composition of assignments recommended by RDM on a historical basis. Efforts to adjust the target percentages in an attempt to reach predetermined minority composition goals required a manual appraisal of previous assignment solutions. The magnitude of a manual appraisal severely limited the effectiveness of timely adjustments of the minority composition.

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A systematic, comprehensive methodology for the examination of historical assignment data and for the automatic generation of minority composition target percentages was necessary to ensure timely adjustments to the target percentages and thus to achieve maximum adherence to predetermined minority composition goals.

Solution methodology

The generation of training assignment minority composition target percentages must be performed concurrently with the processing of the Standard Training Assignment Quota Deck. Consequently, the Standard Training Assignment Quota Card Processor requires the following input parameters:

(1) the Prerequisite Dictionary tape

(2) the Standard Training Assignment Quota deck

(3) the Assignment Text Dictionary tape

(4) the SIMAAR Year-to-Date Summary tape

(5) a $BOUNDS control card specifying the highest value to which the computed target percentage may be set. (The $BOUNDS control card does not apply to manual override targets.) The default limit is 50%.

The last three input parameters are required only for the generation of the target percentages.

Although designed as an automated process, the generation of target percentages may be inhibited for individual quotas and will be done for all quota cards containing a target percentage (0 - 100) or the literal "FS" (fair-share) in card columns 67-69 of the Standard Training Assignment Quota Cards. Thus, any non-blank entry will be interpreted as a user override.

Unless specifically overridden by user-defined target percentages, minority composition targets will be computed as follows:

Where: T = the minority target percentage for a quota

G = the annual goal per cent for the MOS associated with the quota

N = the total number of recruits assigned to the MOS to date

Q = the quota specified in the quota card

M = the total number of minority recruits assigned to the MOS to date

B = the upper bound specified in the $BOUNDS control card. (If no $BOUND control card was input, B will set to a default value, currently 50%).

$$T = \frac{100\left[\frac{G}{100}(N+Q) - M\right]}{Q} \qquad 0 \leq T \leq B$$

If T is negative, the target is automatically set to zero.

It should be noted that the following conditions will automatically cause the target to be set to the fair-share target:

- the assignment symbol specified in the quota card has no corresponding MOS defined on the SIMAAR Year-to-Date Summary tape
- an MOS has been defined on the SIMAAR Year-to-Date Summary tape but no goal has been defined for the MOS.

In either case, a diagnostic will be printed.

Output consists of a minority target percentage for each Standard Training Assignment Quota card input to the RDM run. These target percentages are used by the minority distribution policy optimization algorithm.

TAPE RENTAL MANAGEMENT

The preservation of assignment data for historical analyses is a relatively small but crucial aspect of the recruit assignment process.

The assignment runs made each month produce assignment data that is stored on magnetic tape. As each run oroduces one magnetic tape, and as a run is made each month for each of the two recruit depots, a large quantity of magnetic tapes (24 per year) is allocated for data storage in a very short while (at considerable expense to the Marine Corps).

The volume of data stored on each magnetic tape is small compared to the storage capacity of a reel of magnetic tape. Thus, it is possible to store as much as one year's data for a recruit depot on a single reel of magnetic tape. The task is largely clerical, but previous efforts on the part of the USMC to condense the stored historical assignment data have been spontaneous and somewhat haphazard.

The condensing of recruit assignment data is external to RDM execution. However, the file manipulation is of sufficient volume as to complicate the SCOPE card deck set-up.

To minimize error, the condensing of the data should occur on a quarterly basis, and a complete SCOPE deck set-up example for each quarter was added to the Recruit Distribution Model User's Guide.[9]

[9] Exhibits may be found under "Typical SCOPE and Model Run Deck Set-ups," USMC Recruit Distribution Model (RDM), User's Guide/Technical Report, contract M00027-77-C-0014, September 1977.

Appendix A

GLOSSARY

This glossary has been prepared specifically for this report concerning the Recruit Distribution Model (RDM). Certain terms are specific for this model and when used to describe processes in other models must be modified accordingly.

ALGORITHM	A closed set of relatively simple mathematical (or computer) operations used iteratively to solve more complex problems.
ASSIGNMENT SYMBOL	An acronym signifying a general category of training or duty assignments for recruit graduates. For any particular run of the RDM, the assignment symbols will typically have a class convening date attached, which restricts the recruits to those who will arrive in time to begin the particular class. Examples of assignment symbols are: BEC—Basic Electronics Class, 50300--Infantry FST, BADE—Basic Administration Course, East Coast, and FRADIO—Field Radio Course, 29 Palms.
BY-DATE	A calendar date, usually set as an integral part of a training quota for a specific class at a training facility. By-dates may be: "Late," signifying the student must arrive on or before a certain date to ensure being present when the class starts; or "Early," signifying the student must not arrive before a certain date to control excessive PAT time or not exceed billeting or transportation capacities.
BY-DATE WAIVER	Option in which model ignores failure to meet early by-date ("must arrive on or after") for minority recruits only. Option not available for majority recruits.
DESIRABILITY LEVELS	Sets of prerequisites which when "ANDed" together express characteristics which would be desirable for a recruit to possess if assigned to a particular quota. A given quota generally has several levels of desirability which are ordered in a declining hierarchy. These levels are usually expressed in cuts of AA scores, civilian schooling, age, length of enlistment or enlistment guarantee. The mandatory level is the lowest of the prerequisite levels and is used by the QUOTFIND algorithm to determine a basic eligibility for assignment.
DICTIONARY	The semi-permanent data base containing the great majority of the parameters expressing policies governing the assignment of graduating recruits to further training assignments or to duty. Typically, these policies are expressed as mandatory and desirable prerequisites for training.
DIRECT MOS ASSIGNMENT	An assignment for graduating recruits which is determined outside of the optimizing modules of the RDM. The quota specifies a four-digit MOS, the number required, a by-date to arrive, and other prerequisites if appropriate. Those recruits whose RAMS records contain the same four-digit code in the recommended for MOS field, up to the number specified, will receive appropriate orders for the assignment regardless of any priorities, or other optimizing functions in the run.

ENLISTMENT GUARANTEE PROGRAM	The general class of recruit contract agreements, executed by the recruiting service, for which the Marine is guaranteed assignment to training for a general set of schools or skills (e.g., aviation guarantee), a set of one or more occupational skills, or a specific MOS.
ENTRY-LEVEL TRAINING	That period of the first-term Marine's service, after recruit training, during which he acquires skills for a specific MOS above the basic and trainee level.
FAIR SHARE	The sharing of resources to demands such that the ratio of resources allocated to each demand within the same priority group is equal.
FEASFIND	The optimizing algorithm in the RDM which maximizes the selection of recruit graduates for a particular training quota such that they possess the maximum possible number of desirable assignment characteristics over and above mandatory characteristics.
FORD-FULKERSON PRIMAL-DUAL NETWORK FLOW ALGORITHM	An algorithm for producing optimal solutions to transhipment and assignment problems. It is in general more efficient than other algorithms which are currently in operational use for solving the general class of transportation problems.
MAXIMIN	In the RDM, that option of the PAT line minimization module which has the objective of maximizing the number of recruit assignments with disproportionately small contributions to the total PAT line.
MINIMAX	In the RDM, that option of the PAT line minimization module which has the objective of minimizing the number of recruit assignments with disproportionately large contribution to the total PAT line.
OPTIMIZATION	The process by which resources are allocated to demands (requirements) in a manner which maximizes or minimizes a given utility or cost.
"OPTIMIZE"	The last of the optimizing algorithms in the RDM. "OPTIMIZE", while honoring the constraints and solutions of all previous optimizations, rearranges assignments, where possible, to ensure that the selection relevant aptitude scores, summed over all assignments, is a maximum.
OUTPOST DATE	That calendar date on which a recruit and his series is scheduled to graduate from recruit training.
OVERLAY	A computer programming technique which brings processing routines into high-speed storage from some other slower means of storage for a specific set of operations. Used primarily when total storage requirements for a model and instructions exceed the available main storage.

PAT LINE	The Personnel Awaiting Training category of manpower utilization schemes. This category is considered part of the training line and is an overhead resulting from nonchargeable Marines waiting for an available school seat.
PREREQUISITE	The characteristic of a demand which determines if a particular resource is eligible for allocation to the demand. In the RDM these prerequisites are either mandatory or desirable attributes such as aptitude area (AA) scores, age, education, guarantee, etc.
QUOTFIND	The optimizing algorithm of the RDM which ensures that the maximum number of training quotas are filled. This algorithm works only with mandatory prerequisites, permits consideration of differential priority of fill with specified differential ("unfair") sharing within identical fill priorities.
SCOPE	The operating system for the large Control Data Corporation computers. The SCOPE control card deck set up instructs the computer how to process the model being run, and provides instruction on which data files to use.
SLACK	A pseudo demand or supply used for control purposes in a resource allocation problem. Slack also refers to flexibility or tradeoff potential. In the sequential optimization processes, each step typically uses some of the remaining slack. In the recruit assignment problem, slack results from the fact that most recruits are usually eligible for many different assignments.
SPECIAL ASSIGNMENT	An assignment for a graduating recruit determined outside of the optimizing modules of the RDM. These assignments are processes "by-name" by matching a recruit's social security number to a specific assignment quota.
TRAINING QUOTA	A numeric goal attached to a specific school assignment symbol. The QUOTFIND allocator ensures maximum fill of all training quotas while accommodating differential fill priority, fair or unfair sharing within fill priorities, basic eligibility for assignment, and adherence to "early" and/or "late" by-dates.

APPENDIX B
— RESULTS OF MINORITY POLICY OPTIMIZATION —

MINORITY DISTRIBUTIONS RECOMMENDED IN SEPTEMBER 1977 BY OCCFIELD, MARINE CORPS RECRUIT DEPOT, GUARANTEE STATUS, AND RUN TYPE

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	01	60	35%	33	27%	93	32%	31%
Parris Island: FF/PAT	01	59	36%	34	26%	93	32%	31%
Parris Island: PAT/FF	01	60	32%	33	33%	93	32%	31%
San Diego: OPER.	01	35	34%	59	31%	94	32%	31%
San Diego: FF/PAT	01	36	44%	58	26%	94	33%	31%
San Diego: PAT/FF	01	34	44%	60	27%	94	33%	31%
Combined: OPER.	01	95	35%	92	29%	187	32%	31%
Combined: FF/PAT	01	95	39%	92	26%	187	33%	31%
Combined: PAT/FF	01	94	36%	93	29%	187	33%	31%
Parris Island: OPER.	03	259	17%	303	53%	562	36%	31%
Parris Island: FF/PAT	03	259	17%	303	54%	562	37%	31%
Parris Island: PAT/FF	03	257	18%	305	52%	562	37%	31%
San Diego: OPER.	03	190	21%	576	44%	766	39%	31%
San Diego: FF/PAT	03	189	21%	577	45%	766	39%	31%
San Diego: PAT/FF	03	193	24%	773	44%	776	39%	31%
Combined: OPER.	03	449	19%	879	47%	1328	38%	31%
Combined: FF/PAT	03	448	19%	880	48%	1328	38%	31%
Combined: PAT/FF	03	450	21%	878	47%	1328	38%	31%

A total of 309 availables categorized as follows have been eliminated from this table: Rejected due to fatal record errors, N = 2; unusable, N = 97; received assignment symbol with no associated MOS, N = 210.

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Run Identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	04	1	100%	6	50%	7	57%	31%
Parris Island: FF/PAT	04	2	100%	5	0%	7	29%	31%
Parris Island: PAT/FF	04	4	50%	3	0%	7	29%	31%
San Diego: OPER.	04	2	50%	1	0%	3	33%	31%
San Diego: FF/PAT	04	1	0%	2	0%	3	0%	31%
San Diego: PAT/FF	04	2	0%	1	0%	3	0%	31%
Combined: OPER.	04	3	67%	7	43%	10	50%	31%
Combined: FF/PAT	04	3	67%	7	0%	10	20%	31%
Combined: PAT/FF	04	6	33%	4	0%	10	20%	31%
Parris Island: OPER.	08	117	21%	32	84%	149	35%	31%
Parris Island: FF/PAT	08	119	22%	30	87%	149	35%	31%
Parris Island: PAT/FF	08	111	17%	38	87%	149	35%	31%
San Diego: OPER.	08	98	19%	39	74%	137	35%	31%
San Diego: FF/PAT	08	99	19%	38	74%	137	34%	31%
San Diego: PAT/FF	08	91	12%	46	78%	137	34%	31%
Combined: OPER.	08	215	20%	71	79%	286	35%	31%
Combined: FF/PAT	08	218	21%	68	79%	286	35%	31%
Combined: PAT/FF	08	202	15%	84	82%	286	35%	31%
Parris Island: OPER.	11	17	12%	5	60%	22	23%	31%
Parris Island: FF/PAT	11	18	17%	4	50%	22	23%	31%
Parris Island: PAT/FF	11	18	17%	4	50%	22	23%	31%
San Diego: OPER.	11	15	0%	8	88%	23	30%	31%
San Diego: FF/PAT	11	15	7%	8	88%	23	35%	31%
San Diego: PAT/FF	11	16	13%	7	86%	23	35%	31%
Combined: OPER.	11	32	6%	13	77%	45	27%	31%
Combined: FF/PAT	11	33	12%	12	75%	45	27%	31%
Combined: PAT/FF	11	34	15%	11	73%	45	27%	31%

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Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	13	87	16%	32	81%	117	34%	31%
Parris Island: FF/PAT	13	83	17%	36	72%	119	34%	31%
Parris Island: PAT/FF	13	75	11%	44	73%	119	34%	31%
San Diego: OPER.	13	77	17%	32	72%	109	33%	31%
San Diego: FF/PAT	13	78	17%	31	74%	109	33%	31%
San Diego: PAT/FF	13	69	17%	40	60%	109	33%	31%
Combined: OPER.	13	164	16%	64	77%	228	33%	31%
Combined: FF/PAT	13	161	17%	67	73%	228	33%	31%
Combined: PAT/FF	13	144	14%	84	67%	228	33%	31%
Parris Island: OPER.	14	0	0%	3	67%	3	67%	31%
Parris Island: FF/PAT	14	0	0%	3	67%	3	67%	31%
Parris Island: PAT/FF	14	0	0%	3	67%	3	67%	31%
San Diego: OPER.	14	0	0%	5	20%	5	20%	31%
San Diego: FF/PAT	14	0	0%	5	20%	5	20%	31%
San Diego: PAT/FF	14	0	0%	5	20%	5	20%	31%
Combined: OPER.	14	0	0%	8	38%	8	38%	31%
Combined: FF/PAT	14	0	0%	8	38%	8	38%	31%
Combined: PAT/FF	14	0	0%	8	38%	8	38%	31%
Parris Island: OPER.	15	0	0%	5	40%	5	40%	31%
Parris Island: FF/PAT	15	0	0%	5	40%	5	40%	31%
Parris Island: PAT/FF	15	0	0%	5	40%	5	40%	31%
San Diego: OPER.	15	1	0%	5	20%	6	17%	31%
San Diego: FF/PAT	15	1	0%	5	20%	6	17%	31%
San Diego: PAT/FF	15	1	0%	5	20%	6	17%	31%
Combined: OPER.	15	1	0%	10	30%	11	27%	31%
Combined: FF/PAT	15	1	0%	10	30%	11	27%	31%
Combined: PAT/FF	15	1	0%	10	30%	11	27%	31%

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Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	18	31	10%	27	63%	58	34%	31%
Parris Island: FF/PAT	18	33	6%	25	72%	58	34%	31%
Parris Island: PAT/FF	18	45	16%	13	100%	58	34%	31%
San Diego: OPER.	18	37	3%	45	60%	82	34%	31%
San Diego: FF/PAT	18	39	3%	43	60%	82	33%	31%
San Diego: PAT/FF	18	48	4%	34	74%	82	33%	31%
Combined: OPER.	18	68	6%	72	61%	140	34%	31%
Combined: FF/PAT	18	72	4%	68	65%	140	34%	31%
Combined: PAT/FF	18	93	10%	47	81%	140	34%	31%
Parris Island: OPER.	21	21	5%	16	75%	37	35%	31%
Parris Island: FF/PAT	21	23	9%	14	71%	37	32%	31%
Parris Island: PAT/FF	21	24	8%	13	77%	37	32%	31%
San Diego: OPER.	21	28	21%	10	60%	38	32%	31%
San Diego: FF/PAT	21	23	13%	15	60%	38	32%	31%
San Diego: PAT/FF	21	27	17%	11	64%	38	32%	31%
Combined: OPER.	21	49	14%	26	69%	75	33%	31%
Combined: FF/PAT	21	46	11%	29	66%	75	32%	31%
Combined: PAT/FF	21	51	14%	24	71%	75	32%	31%
Parris Island: OPER.	23	12	17%	1	100%	13	23%	31%
Parris Island: FF/PAT	23	12	17%	1	100%	13	23%	31%
Parris Island: PAT/FF	23	12	17%	1	100%	13	23%	31%
San Diego: OPER.	23	16	31%	1	100%	17	35%	31%
San Diego: FF/PAT	23	16	25%	1	100%	17	29%	31%
San Diego: PAT/FF	23	16	25%	1	100%	17	29%	31%
Combined: OPER.	23	28	25%	2	100%	30	30%	31%
Combined: FF/PAT	23	28	21%	2	100%	30	27%	31%
Combined: PAT/FF	23	28	21%	2	100%	30	27%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC.

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	25	134	23%	136	43%	270	33%	31%
Parris Island: FF/PAT	25	132	23%	138	43%	270	33%	31%
Parris Island: PAT/FF	25	137	27%	133	40%	270	33%	31%
San Diego: OPER.	25	122	19%	167	44%	289	33%	31%
San Diego: FF/PAT	25	122	21%	167	43%	289	34%	31%
San Diego: PAT/FF	25	124	21%	165	44%	289	34%	31%
Combined: OPER.	25	256	21%	303	43%	559	33%	31%
Combined: FF/PAT	25	254	22%	305	43%	559	34%	31%
Combined: PAT/FF	25	261	24%	298	42%	559	34%	31%
Parris Island: OPER.	26	9	0%	13	0%	22	0%	31%
Parris Island: FF/PAT	26	9	0%	13	0%	22	0%	31%
Parris Island: PAT/FF	26	9	0%	13	0%	22	0%	31%
San Diego: OPER.	26	1	0%	24	8%	25	8%	31%
San Diego: FF/PAT	26	1	0%	24	8%	25	8%	31%
San Diego: PAT/FF	26	1	0%	24	8%	25	8%	31%
Combined: OPER.	26	10	0%	37	5%	47	4%	31%
Combined: FF/PAT	26	10	0%	37	5%	47	4%	31%
Combined: PAT/FF	26	10	0%	37	5%	47	4%	31%
Parris Island: OPER.	28	14	21%	27	26%	41	24%	31%
Parris Island: FF/PAT	28	14	21%	27	22%	41	22%	31%
Parris Island: PAT/FF	28	14	21%	27	22%	41	22%	31%
San Diego: OPER.	28	9	0%	48	27%	57	23%	31%
San Diego: FF/PAT	28	9	0%	48	27%	57	23%	31%
San Diego: PAT/FF	28	9	0%	48	27%	57	23%	31%
Combined: OPER.	28	23	13%	75	27%	98	23%	31%
Combined: FF/PAT	28	23	13%	75	25%	98	22%	31%
Combined: PAT/FF	28	23	13%	75	25%	98	22%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	30	46	35%	137	33%	183	33%	31%
Parris Island: FF/PAT	30	45	36%	138	33%	183	33%	31%
Parris Island: PAT/FF	30	42	40%	141	31%	183	33%	31%
San Diego: OPER.	30	27	37%	167	30%	194	31%	31%
San Diego: FF/PAT	30	30	37%	164	31%	194	32%	31%
San Diego: PAT/FF	30	32	41%	162	30%	194	32%	31%
Combined: OPER.	30	73	36%	304	31%	377	32%	31%
Combined: FF/PAT	30	75	36%	302	32%	377	33%	31%
Combined: PAT/FF	30	74	41%	303	31%	377	33%	31%
Parris Island: OPER.	31	0	0%	10	90%	10	90%	31%
Parris Island: FF/PAT	31	0	0%	10	90%	10	90%	31%
Parris Island: PAT/FF	31	0	0%	10	90%	10	90%	31%
San Diego: OPER.	31	0	0%	10	80%	10	80%	31%
San Diego: FF/PAT	31	0	0%	10	80%	10	80%	31%
San Diego: PAT/FF	31	0	0%	10	80%	10	80%	31%
Combined: OPER.	31	0	0%	20	85%	20	85%	31%
Combined: FF/PAT	31	0	0%	20	85%	20	85%	31%
Combined: PAT/FF	31	0	0%	20	85%	20	85%	31%
Parris Island: OPER.	32	0	0%	3	67%	3	67%	31%
Parris Island: FF/PAT	32	0	0%	3	67%	3	67%	31%
Parris Island: PAT/FF	32	0	0%	3	67%	3	67%	31%
San Diego: OPER.	32	0	0%	4	50%	4	50%	31%
San Diego: FF/PAT	32	0	0%	4	50%	4	50%	31%
San Diego: PAT/FF	32	0	0%	4	50%	4	50%	31%
Combined: OPER.	32	0	0%	7	57%	7	57%	31%
Combined: FF/PAT	32	0	0%	7	57%	7	57%	31%
Combined: PAT/FF	32	0	0%	7	57%	7	57%	31%

DSA ASSOCIATES, INC.

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	33	37	32%	85	33%	122	33%	31%
Parris Island: FF/PAT	33	37	32%	85	34%	122	34%	31%
Parris Island: PAT/FF	33	37	32%	85	34%	122	34%	31%
San Diego: OPER.	33	28	39%	83	25%	111	29%	31%
San Diego: FF/PAT	33	28	39%	83	25%	111	29%	31%
San Diego: PAT/FF	33	28	39%	83	25%	111	29%	31%
Combined: OPER.	33	65	35%	168	29%	233	31%	31%
Combined: FF/PAT	33	65	35%	168	30%	233	31%	31%
Combined: PAT/FF	33	65	35%	168	30%	233	31%	31%

Parris Island: OPER.	34	9	11%	18	44%	27	33%	31%
Parris Island: FF/PAT	34	9	11%	18	50%	27	37%	31%
Parris Island: PAT/FF	34	10	10%	17	53%	27	37%	31%
San Diego: OPER.	34	6	17%	22	23%	28	21%	31%
San Diego: FF/PAT	34	5	20%	23	22%	28	21%	31%
San Diego: PAT/FF	34	5	20%	23	22%	28	21%	31%
Combined: OPER.	34	15	13%	40	33%	55	27%	31%
Combined: FF/PAT	34	14	14%	41	34%	55	29%	31%
Combined: PAT/FF	34	15	13%	40	35%	55	31%	31%

Parris Island: OPER.	35	91	20%	191	41%	282	34%	31%
Parris Island: FF/PAT	35	90	19%	192	41%	282	34%	31%
Parris Island: PAT/FF	35	90	19%	192	41%	282	34%	31%
San Diego: OPER.	35	103	25%	139	40%	242	34%	31%
San Diego: FF/PAT	35	102	25%	140	40%	242	34%	31%
San Diego: PAT/FF	35	102	25%	140	40%	242	34%	31%
Combined: OPER.	35	194	23%	330	41%	524	34%	31%
Combined: FF/PAT	35	192	22%	332	40%	524	34%	31%
Combined: PAT/FF	35	192	22%	332	40%	524	34%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC.

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	40	3	33%	6	17%	9	22%	31%
Parris Island: FF/PAT	40	3	33%	6	33%	9	33%	31%
Parris Island: PAT/FF	40	3	33%	6	33%	9	33%	31%
San Diego: OPER.	40	11	9%	1	100%	12	17%	31%
San Diego: FF/PAT	40	11	9%	1	100%	12	17%	31%
San Diego: PAT/FF	40	10	10%	2	50%	12	17%	31%
Combined: OPER.	40	14	14%	7	29%	21	19%	31%
Combined: FF/PAT	40	14	14%	7	43%	21	24%	31%
Combined: PAT/FF	40	13	15%	8	38%	21	24%	31%
Parris Island: OPER.	41	6	50%	3	33%	9	44%	31%
Parris Island: FF/PAT	41	6	33%	3	0%	9	22%	31%
Parris Island: PAT/FF	41	6	17%	3	33%	9	22%	31%
San Diego: OPER.	41	6	50%	3	0%	9	33%	31%
San Diego: FF/PAT	41	5	60%	4	0%	9	33%	31%
San Diego: PAT/FF	41	2	50%	7	29%	9	33%	31%
Combined: OPER.	41	12	50%	6	17%	18	39%	31%
Combined: FF/PAT	41	11	45%	7	0%	18	28%	31%
Combined: PAT/FF	41	8	25%	10	30%	18	28%	31%
Parris Island: OPER.	43	0	0%	0	0%	0	0%	31%
Parris Island: FF/PAT	43	0	0%	0	0%	0	0%	31%
Parris Island: PAT/FF	43	0	0%	0	0%	0	0%	31%
San Diego: OPER.	43	0	0%	2	0%	2	0%	31%
San Diego: FF/PAT	43	0	0%	2	0%	2	0%	31%
San Diego: PAT/FF	43	0	0%	2	0%	2	0%	31%
Combined: OPER.	43	0	0%	2	0%	2	0%	31%
Combined: FF/PAT	43	0	0%	2	0%	2	0%	31%
Combined: PAT/FF	43	0	0%	2	0%	2	0%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC.

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	44	14	21%	7	29%	21	24%	31%
Parris Island: FF/PAT	44	15	20%	6	33%	21	24%	31%
Parris Island: PAT/FF	44	14	21%	7	29%	21	24%	31%
San Diego: OPER.	44	8	38%	17	12%	25	20%	31%
San Diego: FF/PAT	44	10	30%	15	13%	25	20%	31%
San Diego: PAT/FF	44	10	30%	15	13%	25	20%	31%
Combined: OPER.	44	22	27%	24	17%	46	22%	31%
Combined: FF/PAT	44	25	24%	21	19%	46	22%	31%
Combined: PAT/FF	44	24	25%	22	18%	46	22%	31%
Parris Island: OPER.	46	0	0%	7	29%	7	29%	31%
Parris Island: FF/PAT	46	0	0%	7	29%	7	29%	31%
Parris Island: PAT/FF	46	0	0%	7	29%	7	29%	31%
San Diego: OPER.	46	0	0%	2	0%	2	0%	31%
San Diego: FF/PAT	46	0	0%	2	0%	2	0%	31%
San Diego: PAT/FF	46	0	0%	2	0%	2	0%	31%
Combined: OPER.	46	0	0%	9	22%	9	22%	31%
Combined: FF/PAT	46	0	0%	9	22%	9	22%	31%
Combined: PAT/FF	46	0	0%	9	22%	9	22%	31%
Parris Island: OPER.	49	0	0%	7	43%	7	43%	31%
Parris Island: FF/PAT	49	0	0%	7	43%	7	43%	31%
Parris Island: PAT/FF	49	0	0%	7	43%	7	43%	31%
San Diego: OPER.	49	0	0%	6	33%	6	33%	31%
San Diego: FF/PAT	49	0	0%	6	33%	6	33%	31%
San Diego: PAT/FF	49	0	0%	6	33%	6	33%	31%
Combined: OPER.	49	0	0%	13	38%	13	38%	31%
Combined: FF/PAT	49	0	0%	13	38%	13	38%	31%
Combined: PAT/FF	49	0	0%	13	38%	13	38%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC.

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	55	0	0%	8	25%	8	25%	31%
Parris Island: FF/PAT	55	0	0%	8	25%	8	25%	31%
Parris Island: PAT/FF	55	0	0%	8	25%	8	25%	31%
San Diego: OPER.	55	0	0%	10	20%	10	20%	31%
San Diego: FF/PAT	55	0	0%	10	20%	10	20%	31%
San Diego: PAT/FF	55	0	0%	10	20%	10	20%	31%
Combined: OPER.	55	0	0%	18	22%	18	22%	31%
Combined: FF/PAT	55	0	0%	18	22%	18	22%	31%
Combined: PAT/FF	55	0	0%	18	22%	18	22%	31%
Parris Island: OPER.	58	14	21%	2	50%	16	25%	31%
Parris Island: FF/PAT	58	14	21%	2	50%	16	25%	31%
Parris Island: PAT/FF	58	14	21%	2	50%	16	25%	31%
San Diego: OPER.	58	15	7%	2	50%	17	12%	31%
San Diego: FF/PAT	58	15	7%	2	50%	17	12%	31%
San Diego: PAT/FF	58	15	7%	2	50%	17	12%	31%
Combined: OPER.	58	29	14%	4	50%	33	18%	31%
Combined: FF/PAT	58	29	14%	4	50%	33	18%	31%
Combined: PAT/FF	58	29	14%	4	50%	33	18%	31%
Parris Island: OPER.	59	11	9%	0	0%	11	9%	31%
Parris Island: FF/PAT	59	11	9%	0	0%	11	9%	31%
Parris Island: PAT/FF	59	11	9%	0	0%	11	9%	31%
San Diego: OPER.	59	14	14%	0	0%	14	14%	31%
San Diego: FF/PAT	59	14	14%	0	0%	14	14%	31%
San Diego: PAT/FF	59	14	14%	0	0%	14	14%	31%
Combined: OPER.	59	25	12%	0	0%	25	12%	31%
Combined: FF/PAT	59	25	12%	0	0%	25	12%	31%
Combined: PAT/FF	59	25	12%	0	0%	25	12%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC.

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	60	421	13%	0	0%	421	13%	31%
Parris Island: FF/PAT	60	421	13%	0	0%	421	13%	31%
Parris Island: PAT/FF	60	421	13%	0	0%	421	13%	31%
San Diego: OPER.	60	324	13%	1	100%	325	13%	31%
San Diego: FF/PAT	60	324	13%	1	100%	325	13%	31%
San Diego: PAT/FF	60	324	13%	1	100%	325	13%	31%
Combined: OPER.	60	745	13%	1	100%	746	13%	31%
Combined: FF/PAT	60	745	13%	1	100%	746	13%	31%
Combined: PAT/FF	60	745	13%	1	100%	746	13%	31%
Parris Island: OPER.	61	24	17%	0	0%	24	17%	31%
Parris Island: FF/PAT	61	24	17%	0	0%	24	17%	31%
Parris Island: PAT/FF	61	24	17%	0	0%	24	17%	31%
San Diego: OPER.	61	27	15%	1	0%	28	14%	31%
San Diego: FF/PAT	61	27	15%	1	0%	28	14%	31%
San Diego: PAT/FF	61	27	15%	1	0%	28	14%	31%
Combined: OPER.	61	51	16%	1	0%	52	15%	31%
Combined: FF/PAT	61	51	16%	1	0%	52	15%	31%
Combined: PAT/FF	61	51	16%	1	0%	52	15%	31%
Parris Island: OPER.	65	12	17%	0	0%	12	17%	31%
Parris Island: FF/PAT	65	12	17%	0	0%	12	17%	31%
Parris Island: PAT/FF	65	12	17%	0	0%	12	17%	31%
San Diego: OPER.	65	17	12%	0	0%	17	12%	31%
San Diego: FF/PAT	65	17	12%	0	0%	17	12%	31%
San Diego: PAT/FF	65	17	12%	0	0%	17	12%	31%
Combined: OPER.	65	29	14%	0	0%	29	14%	31%
Combined: FF/PAT	65	29	14%	0	0%	29	14%	31%
Combined: PAT/FF	65	29	14%	0	0%	29	14%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC.

Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	66	76	5%	0	0%	76	5%	31%
Parris Island: FF/PAT	66	76	5%	0	0%	76	5%	31%
Parris Island: PAT/FF	66	76	5%	0	0%	76	5%	31%
San Diego: OPER.	66	62	10%	0	0%	62	10%	31%
San Diego: FF/PAT	66	62	10%	0	0%	62	10%	31%
San Diego: PAT/FF	66	62	10%	0	0%	62	10%	31%
Combined: OPER.	66	138	7%	0	0%	138	7%	31%
Combined: FF/PAT	66	138	7%	0	0%	138	7%	31%
Combined: PAT/FF	66	138	7%	0	0%	138	7%	31%
Parris Island: OPER.	68	1	0%	0	0%	1	0%	31%
Parris Island: FF/PAT	68	1	0%	0	0%	1	0%	31%
Parris Island: PAT/FF	68	1	0%	0	0%	1	0%	31%
San Diego: OPER.	68	0	0%	0	0%	0	0%	31%
San Diego: FF/PAT	68	0	0%	0	0%	0	0%	31%
San Diego: PAT/FF	68	0	0%	0	0%	0	0%	31%
Combined: OPER.	68	1	0%	0	0%	1	0%	31%
Combined: FF/PAT	68	1	0%	0	0%	1	0%	31%
Combined: PAT/FF	68	1	0%	0	0%	1	0%	31%
Parris Island: OPER.	70	26	19%	0	0%	26	19%	31%
Parris Island: FF/PAT	70	26	19%	0	0%	26	19%	31%
Parris Island: PAT/FF	70	26	19%	0	0%	26	19%	31%
San Diego: OPER.	70	28	14%	2	100%	30	20%	31%
San Diego: FF/PAT	70	28	14%	2	100%	30	20%	31%
San Diego: PAT/FF	70	28	14%	2	100%	30	20%	31%
Combined: OPER.	70	54	17%	2	100%	56	20%	31%
Combined: FF/PAT	70	54	17%	2	100%	56	20%	31%
Combined: PAT/FF	70	54	17%	2	100%	56	20%	31%

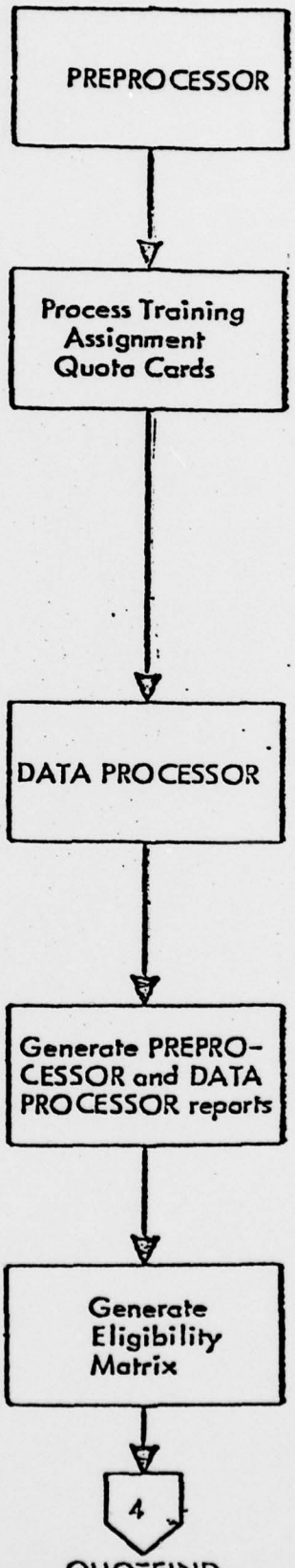
DECISION SYSTEMS DSA ASSOCIATES, INC

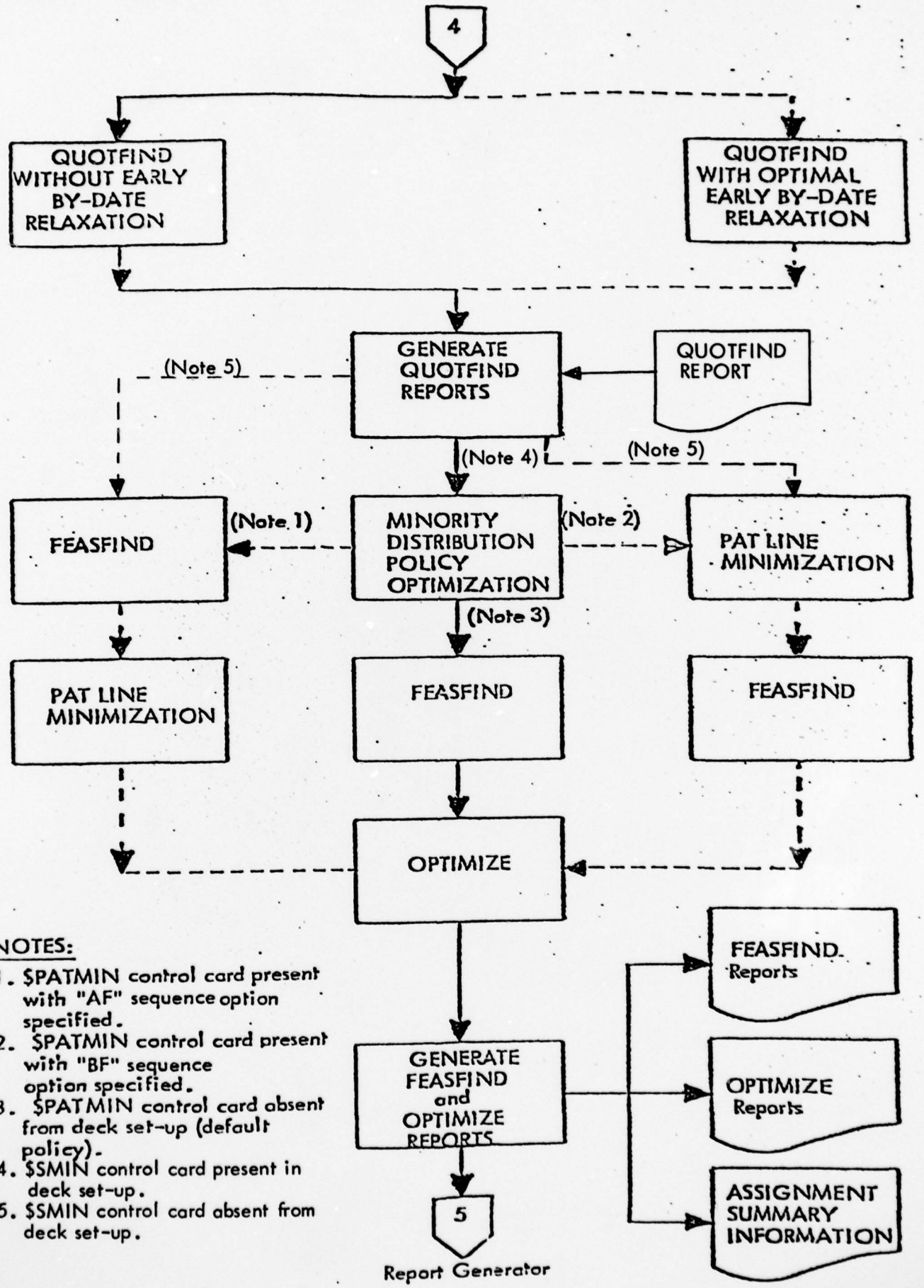
Run identification	Occ-Field	GUAR.	Per cent minority	NON-GUAR.	Per cent minority	TOTAL ASGD.	Per cent minority	Minority target
Parris Island: OPER.	72	3	0%	0	0%	3	0%	31%
Parris Island: FF/PAT	72	3	0%	0	0%	3	0%	31%
Parris Island: PAT/FF	72	3	0%	0	0%	3	0%	31%
San Diego: OPER.	72	3	0%	0	0%	3	0%	31%
San Diego: FF/PAT	72	3	0%	0	0%	3	0%	31%
San Diego: PAT/FF	72	3	0%	0	0%	3	0%	31%
Combined: OPER.	72	6	0%	0	0%	6	0%	31%
Combined: FF/PAT	72	6	0%	0	0%	6	0%	31%
Combined: PAT/FF	72	6	0%	0	0%	6	0%	31%
Parris Island: OPER.	73	5	20%	0	0%	5	20%	31%
Parris Island: FF/PAT	73	5	20%	0	0%	5	20%	31%
Parris Island: PAT/FF	73	5	20%	0	0%	5	20%	31%
San Diego: OPER.	73	5	0%	0	0%	5	0%	31%
San Diego: FF/PAT	73	5	0%	0	0%	5	0%	31%
San Diego: PAT/FF	73	5	0%	0	0%	5	0%	31%
Combined: OPER.	73	10	10%	0	0%	10	10%	31%
Combined: FF/PAT	73	10	10%	0	0%	10	10%	31%
Combined: PAT/FF	73	10	10%	0	0%	10	10%	31%
Parris Island: OPER.	Total	1596	18%	1185	48%	2781	31%	31%
Parris Island: FF/PAT	Total	1596	18%	1185	48%	2781	31%	31%
Parris Island: PAT/FF	Total	1596	18%	1185	48%	2781	31%	31%
San Diego: OPER.	Total	1455	19%	1564	42%	3019	31%	31%
San Diego: FF/PAT	Total	1455	19%	1564	42%	3019	31%	31%
San Diego: PAT/FF	Total	1455	19%	1564	42%	3019	31%	31%
Combined: OPER.	Total	3051	19%	2749	45%	5800	31%	31%
Combined: FF/PAT	Total	3051	19%	2749	45%	5800	31%	31%
Combined: PAT/FF	Total	3051	19%	2749	45%	5800	31%	31%

DECISION SYSTEMS DSA ASSOCIATES, INC.

APPENDIX C

— PROCESS FLOW CHART OF RDM MODEL ASSIGNMENT RUN —

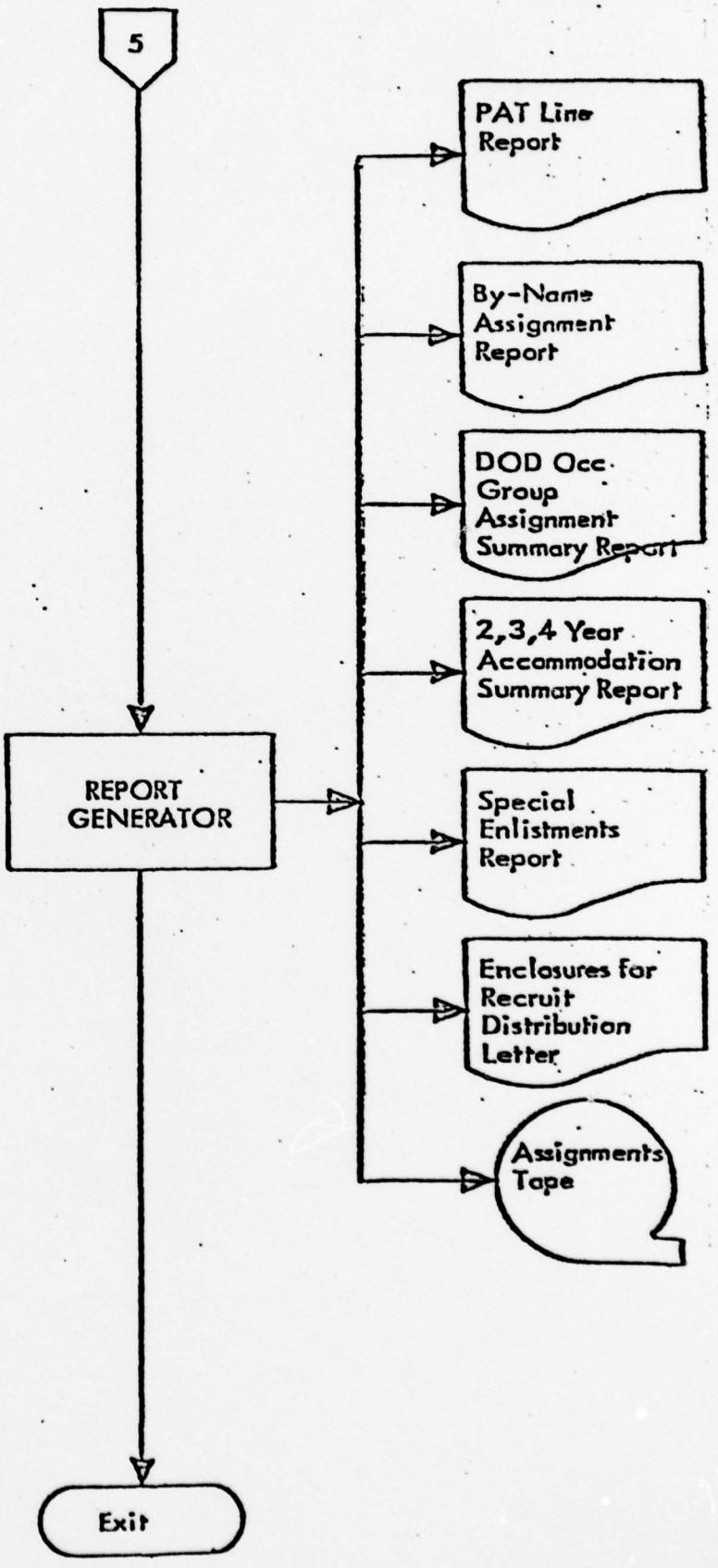




NOTES:

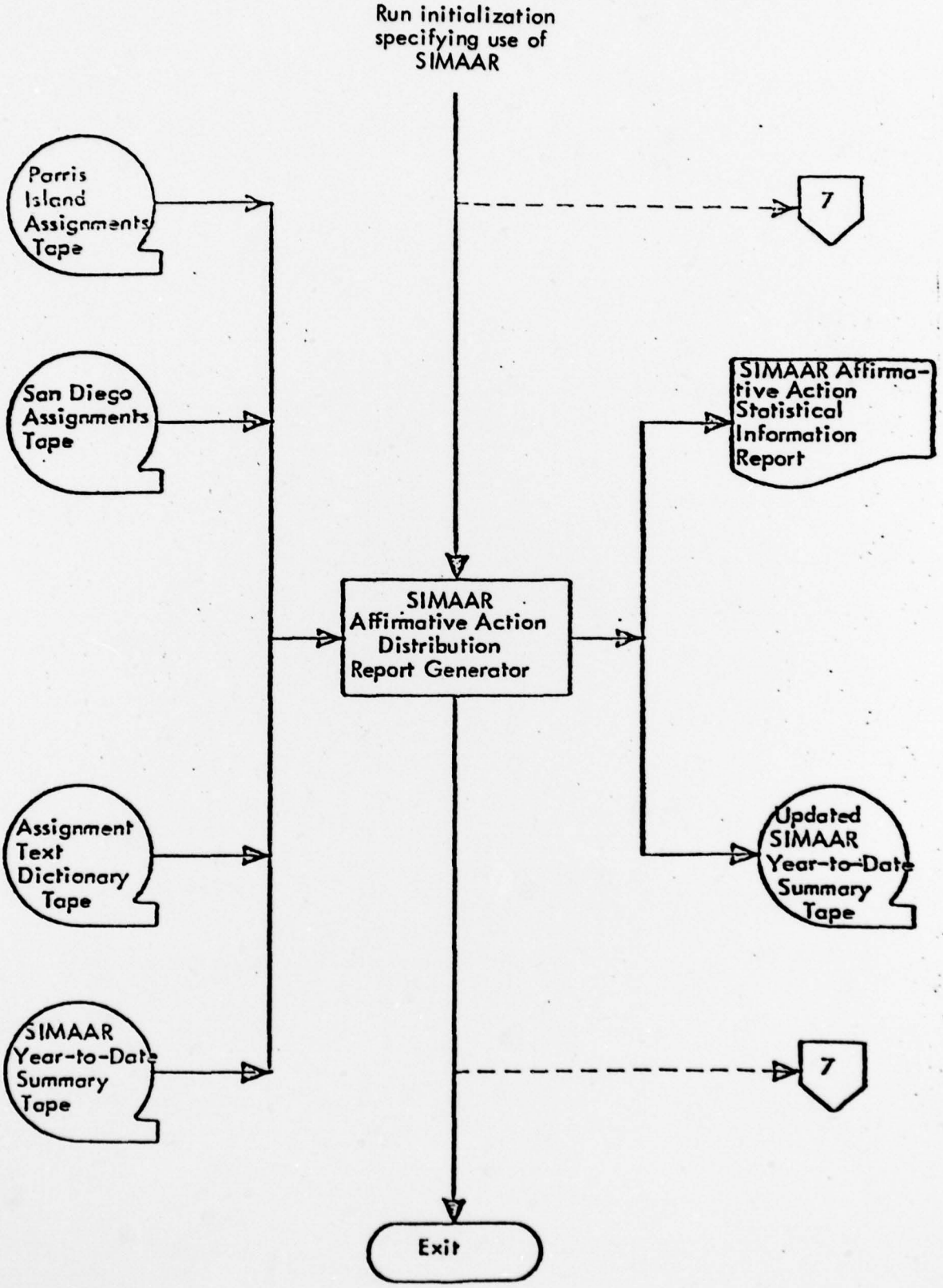
1. $PATMIN control card present with "AF" sequence option specified.
2. $PATMIN control card present with "BF" sequence option specified.
3. $PATMIN control card absent from deck set-up (default policy).
4. $SMIN control card present in deck set-up.
5. $SMIN control card absent from deck set-up.

DECISION SYSTEMS DSA ASSOCIATES, INC.

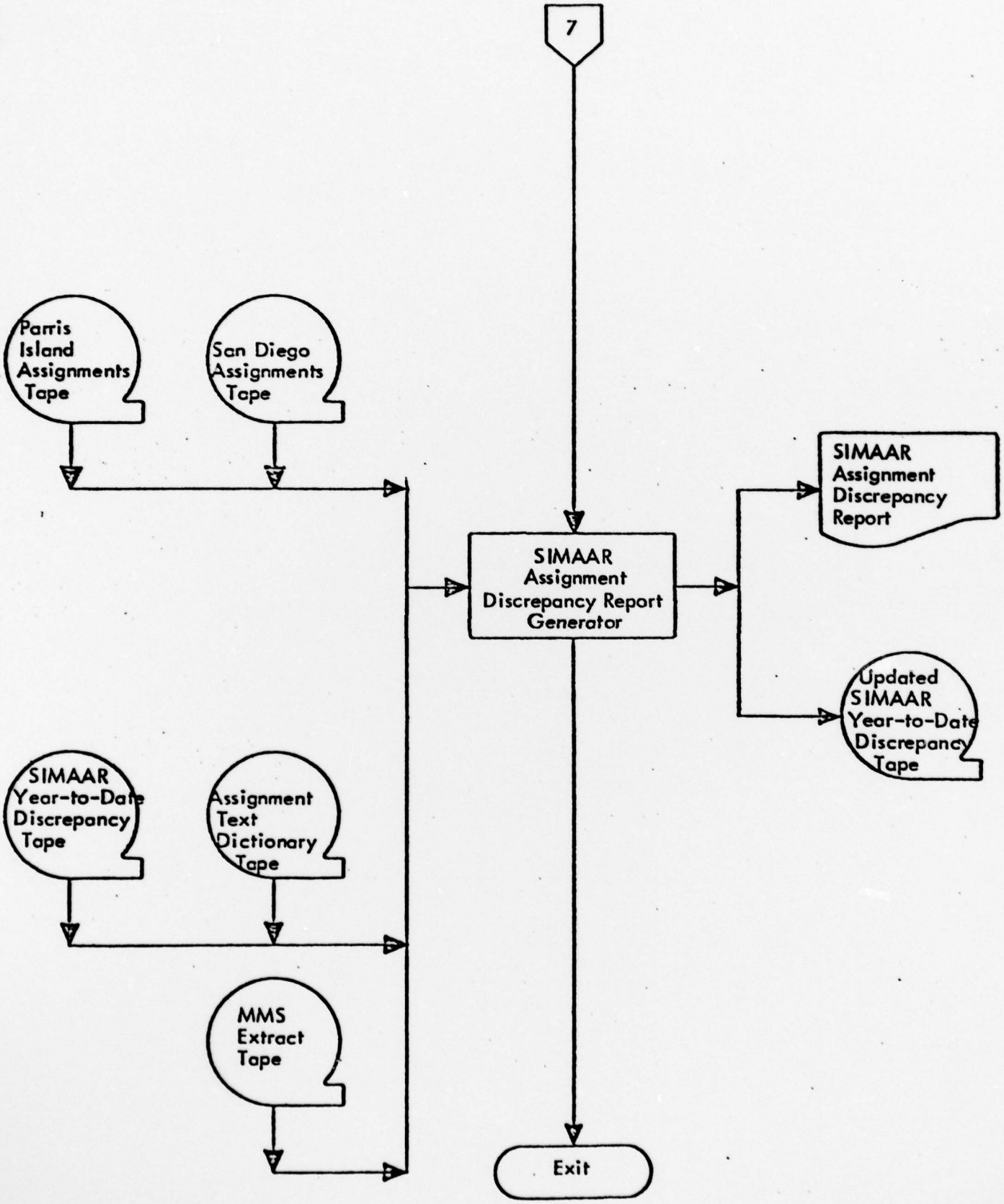


DECISION SYSTEMS DSA ASSOCIATES, INC.

— PROCESS FLOW CHART OF RDM MODEL, SIMAAR RUN —



DECISION SYSTEMS DSA ASSOCIATES, INC.


7
Parris Island Assignments Tape
San Diego Assignments Tape
SIMAAR Assignment Discrepancy Report
SIMAAR Assignment Discrepancy Report Generator
Updated SIMAAR Year-to-Date Discrepancy Tape
SIMAAR Year-to-Date Discrepancy Tape
Assignment Text Dictionary Tape
MMS Extract Tape
Exit